THE HEATING AND VENTILATING MAGAZINE

Vol. XI. No. 4.
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NEW YORK, APRIL, 1914

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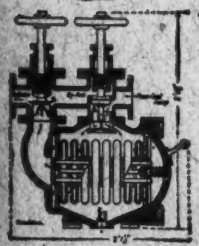

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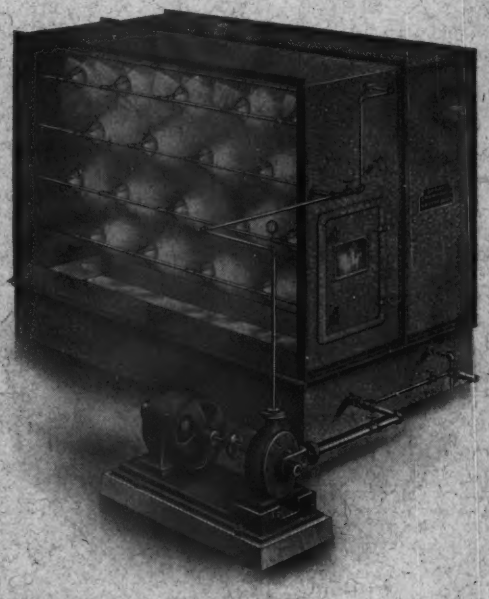

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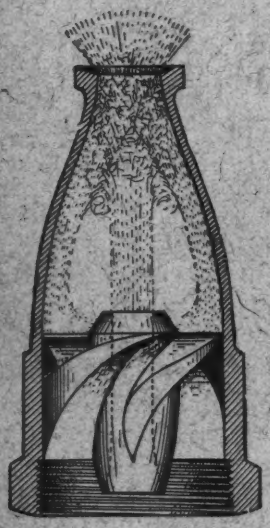

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The Heating and Ventilating Magazine

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DUNHAM

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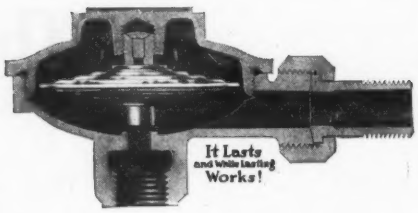

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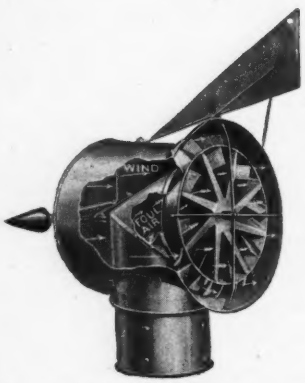

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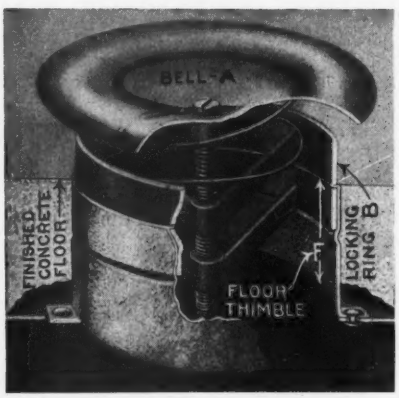

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Note projection of cap which deflects the air towards the floor, thereby eliminating draughts. Compare with other caps.

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK APRIL, 1914

Independent Air Ducts in School Work

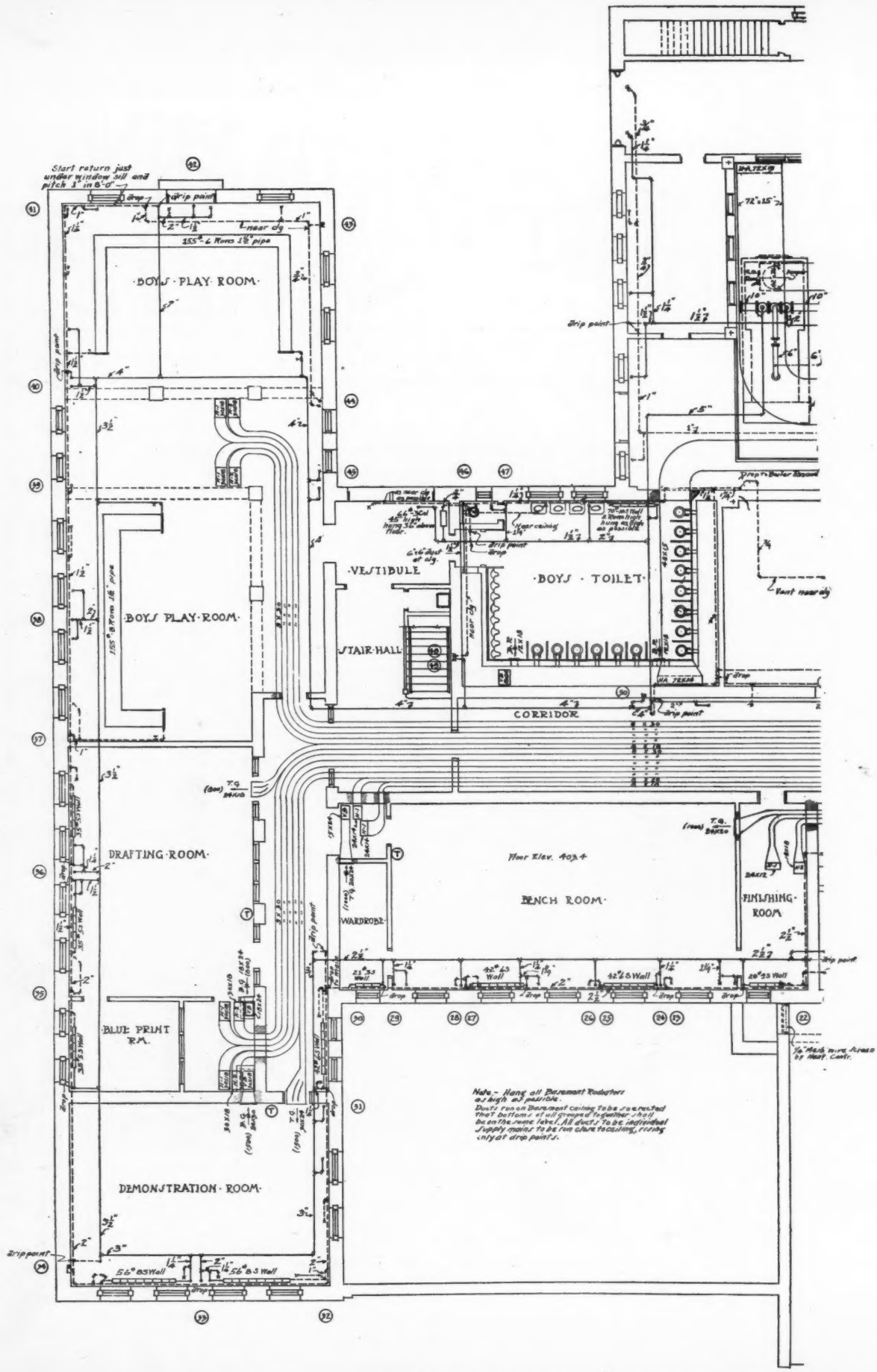
FEATURES OF THE MECHANICAL EQUIPMENT OF THE WATT SCHOOL, PITTSBURGH, PA.

A plant that might be expected to reflect, at least in a measure, the effect of the recent pronouncements of physiologists and others on the subject of heating and ventilation, is that recently designed for the Watt School, in Pittsburgh, for the system was laid out in the full light of the latest information on the subject. How far it departs, if at all, from the recognized standard practice, is one of its many interesting features.

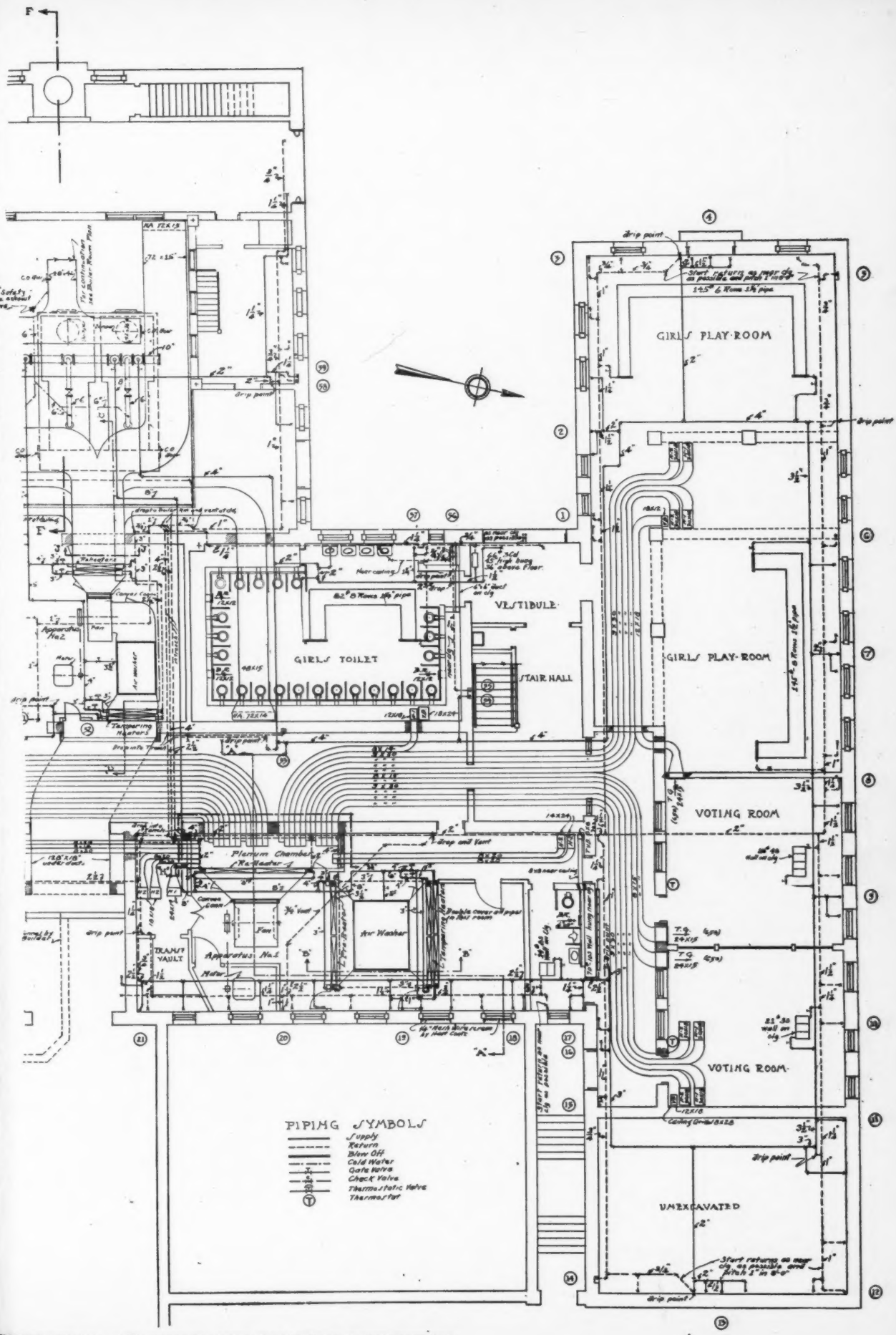
EDITOR'S NOTE.—The accompanying plans are those shown at the March meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, in connection with a discussion of schoolhouse heating and ventilation.

Through the recognition of the new Board of Education of Pittsburgh of the need of the best ventilation it was possible for the engineers to provide for individual air supply and exhaust from every room in the building. Since the system includes air washers, humidification and humidity control, fresh air fans and exhaust fans, it is possible to supply each room with varying qualities of air and to vary the temperature of any given room independent of the others. The separate air ducts are so arranged that the janitor can control the system from one central point.

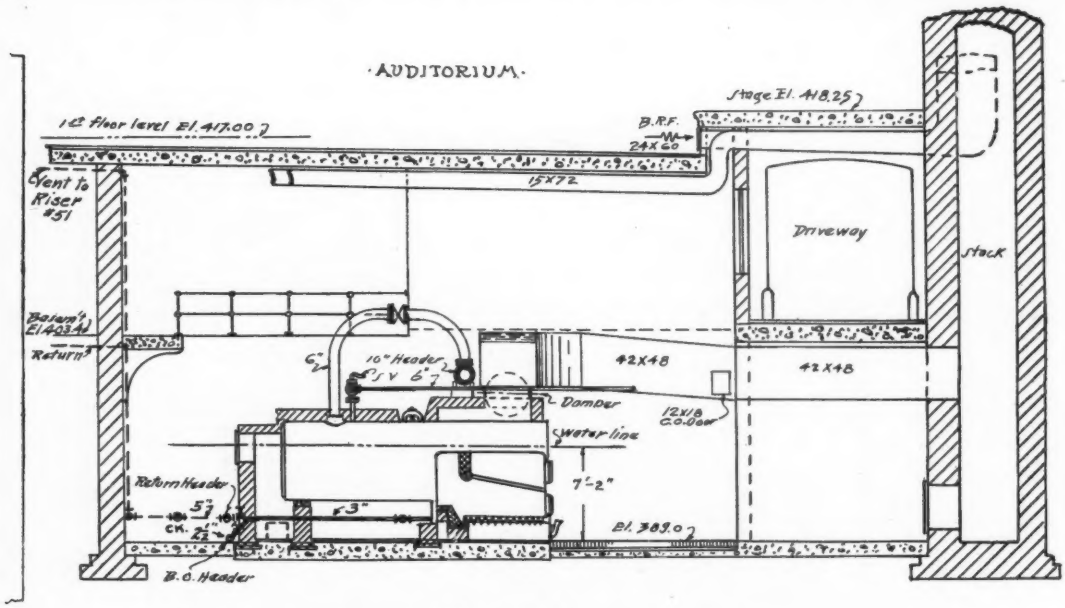
SECTIONAL ELEVATION OF WATT SCHOOL, PITTSBURGH.


BOYS · PLAY · ROOM ·
BOYS PLAY ROOM
VESTIBULE
BOYS · TOILET ·
STAIR HALL
CORRIDOR
DRAFTING ROOM
BENCH ROOM
WARDROBE
FINISHING ROOM
BLUE PRINT R.M.
DEMONSTRATION · ROOM ·
Start return just under window sill and pitch 1" in 8'-0"
Drip point
Note - Hang all Basement Radiators as high as possible.
Duct run on Basement ceiling to be so erected that bottoms of all grouped together shall be on the same level. All ducts to be individual supply mains to be run clear to ceiling, risers only at drip points.

BASEMENT PLAN, WATT SCHOOL, PITTSBURGH, SHOWING



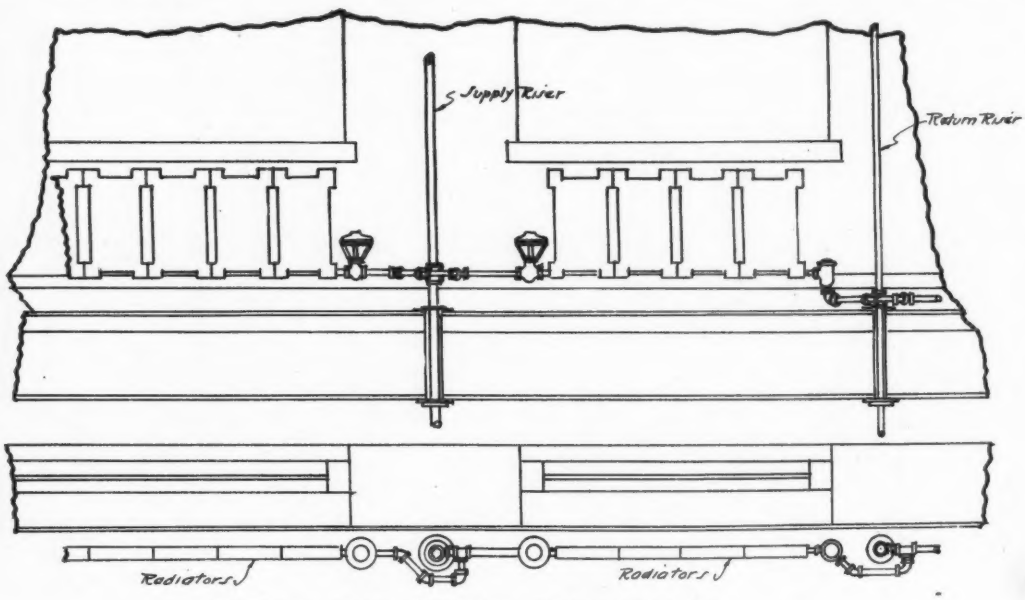
INDIVIDUAL AIR DUCTS AND HEATING EQUIPMENT.



SECTION FF THRU BOILER ROOM.
Scale 1/8" = 1'-0"

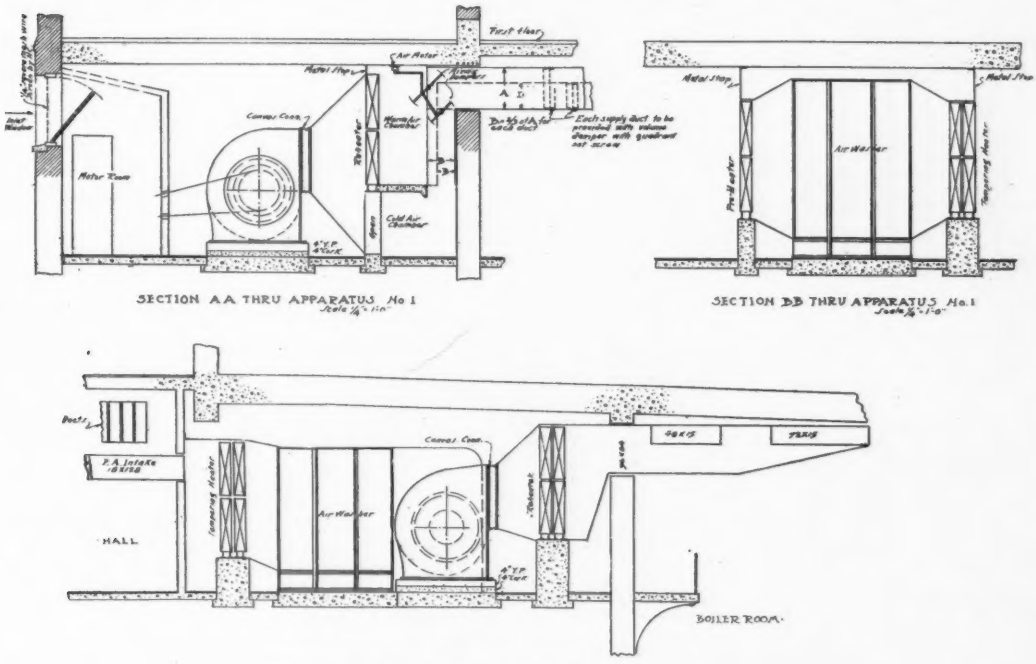
SECTION THROUGH BOILER ROOM, WATT SCHOOL.

It is noteworthy that direct steam is used in the heating of the school's auditorium in addition to the indirect heating. The system of piping for the steam heating of the building is the two-pipe, up-feed, atmospheric system, with returns vented to the atmosphere, through return risers extended through the roof. The radiators are arranged to operate without the use of air valves. The water of condensation is returned to the boilers by gravity. It will be noticed that the returns are brought back to a point above the boilers and dropped close to the boilers. As modulation valves are used on the radiators, this ar-



TYPICAL RAD. RUNOUT CONNECTIONS.
Scale 1/2" = 1'-0"

DETAIL OF RADIATOR CONNECTIONS, WATT SCHOOL.



SECTION AA THRU APPARATUS No 1
Scale ¼" = 1'-0"

SECTION BB THRU APPARATUS No 1
Scale ¼" = 1'-0"

SECTION CC THRU APPARATUS No 2
Scale ¼" = 1'-0"

SECTIONS THROUGH FAN APPARATUS, WATT SCHOOL.

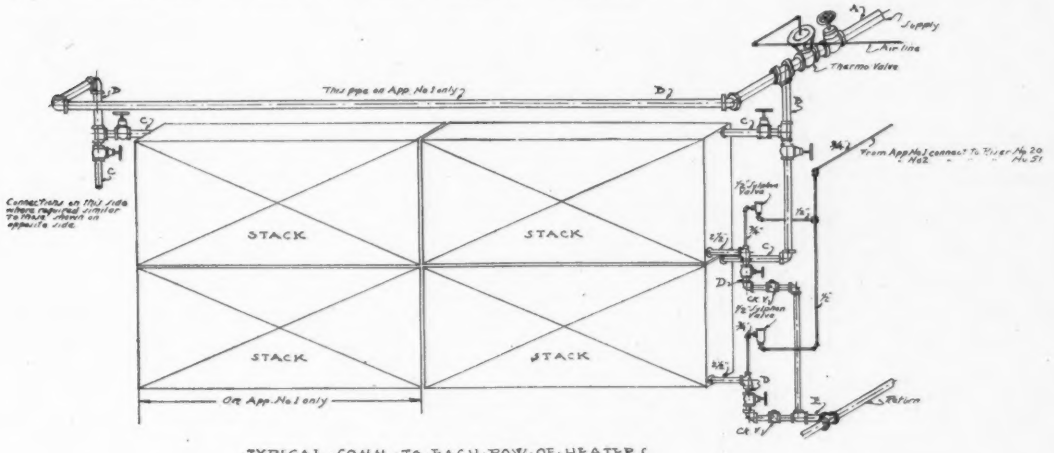
rangement helps to keep the water line in the boilers constant.

There are two fan systems for the supply ventilation and four fan systems for exhaust ventilation. A system of temperature regulation controls the radiators in the classroom, assembly room and other important rooms; also the mixing dampers in the plenum chamber and the Vento heaters.

The steam supply for the building is furnished by three Titusville Kewanee type smokeless, firebox, tubular boilers, each having a guaranteed capacity sufficient to supply 13,000 sq. ft. of equivalent direct steam radiation, with steam pressure at 2 lbs.

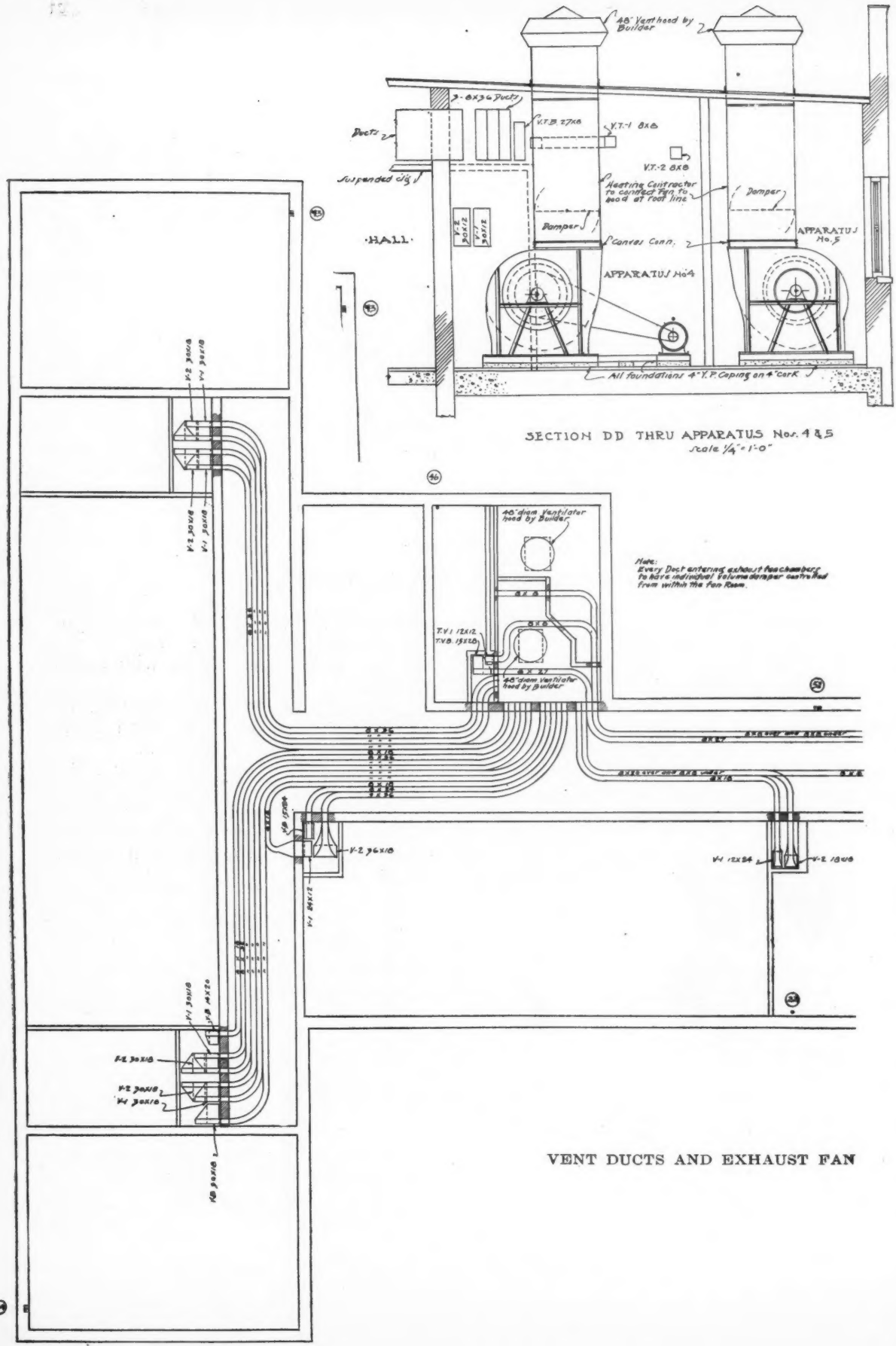
The direct radiators are generally of the wall pattern type, although some regular type radiators are used.

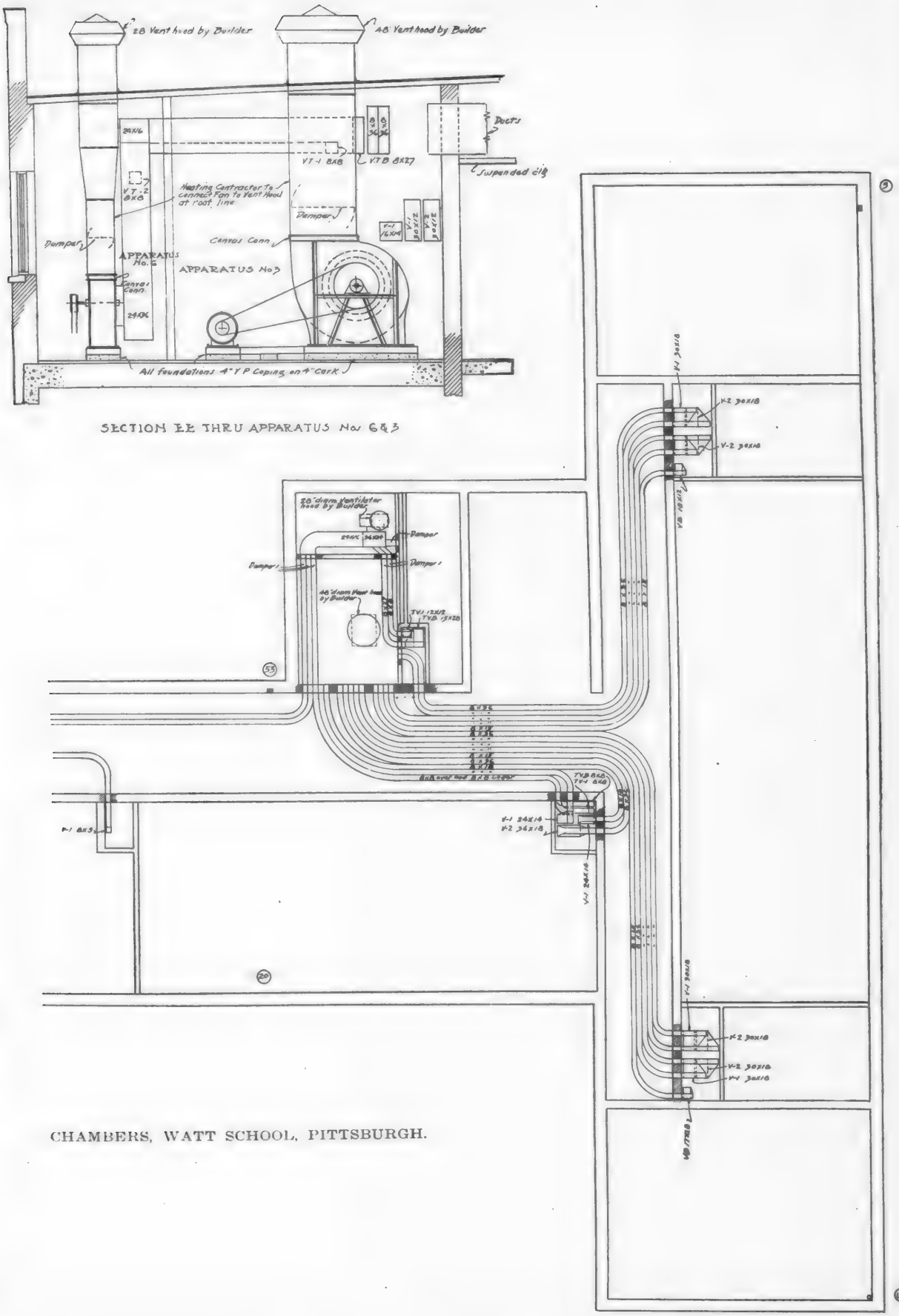
For the indirect heating system, the fans used are the multiblade type, made by the Massachusetts Fan Company. The fans are guaranteed to operate with a tip speed not exceeding 3,500 ft. per minute.



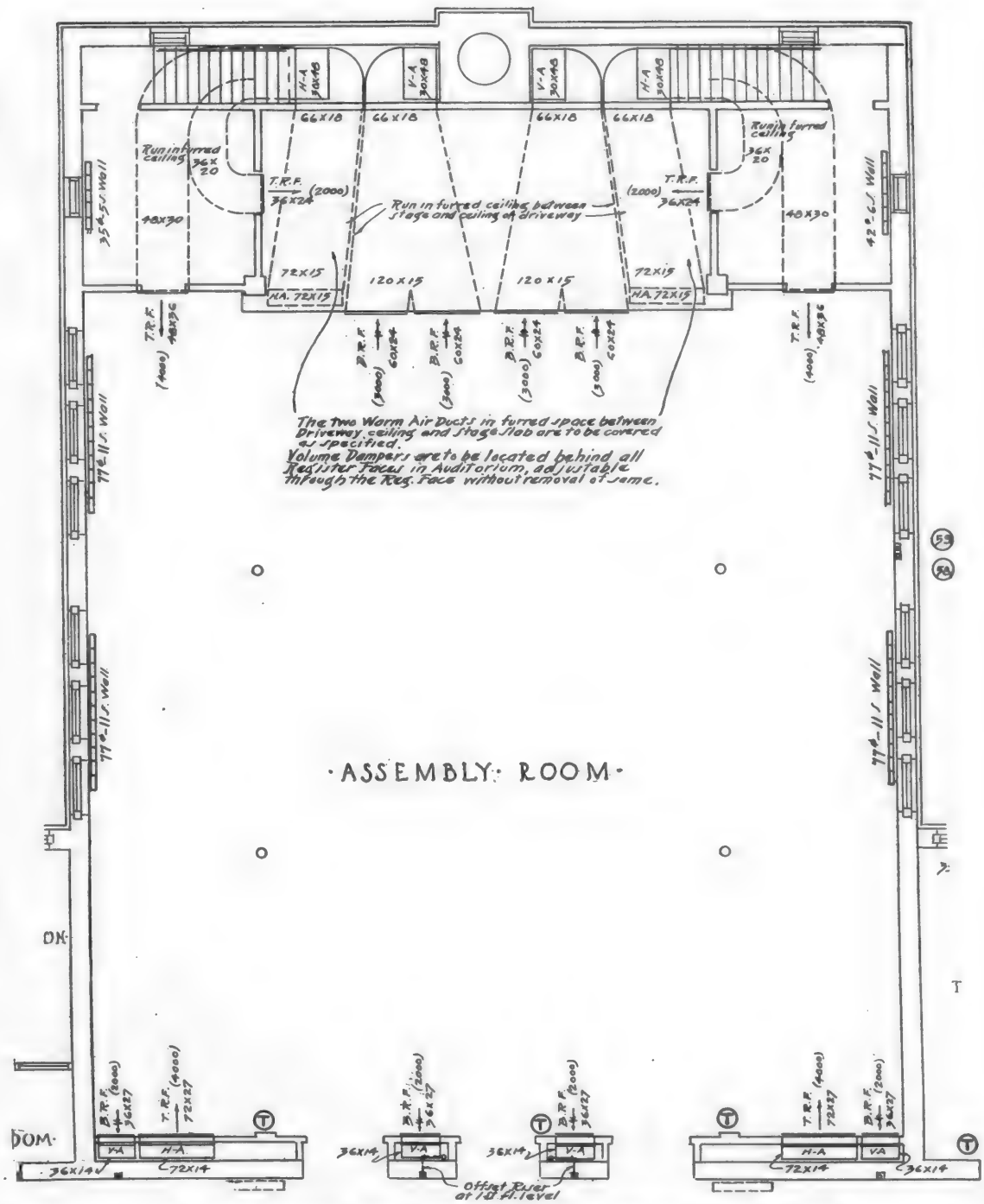
TYPICAL COMM. TO EACH ROW OF HEATERS
Scale ½" = 1'-0"

TYPICAL CONNECTIONS TO EACH ROW OF HEATERS.


48" Vent hood by Builder
3-8X34 Ducts
V.T.B. 27X8
V.T.-1 8X8
V.T.-2 8X8
Ducts
Suspended c/g
Heating Contractor to connect Fan to duct at roof line
Damper
Damper
Canvas Conn.
APPARATUS No. 5
APPARATUS No. 4
HALL
All foundations 4" Y.P. Coping on 4" cork
SECTION DD THRU APPARATUS Nos. 4 & 5
Scale 1/4" = 1'-0"
48" diam Ventilator hood by Builder
Note:
Every Duct entering exhaust fan chamber to have individual Volume damper controlled from within the Fan Room.
V.T.1 12X12
V.T.B. 15X20
48" diam Ventilator hood by Builder
V-2 36X18
V-1 12X34
V-2 18X18
V-1 84X12
V-2 30X18
V-1 30X18
V-2 30X18
V-1 30X18
V-2 30X18
V-1 30X18



CHAMBERS, WATT SCHOOL, PITTSBURGH.



ARRANGEMENTS FOR HEATING AND VENTILATING ASSEMBLY ROOM, WATT SCHOOL.

SUPPLY FANS.

The two supply fans are located as shown in the drawings. Apparatus No. 1, for the classroom supply, is a single inlet, double width, top horizontal discharge, full housed fan, running at 278 R. P. M. and having a capacity of 41,000 cu. ft. per minute. This fan is belt-driven by a 20 H. P. electric motor, with a synchronous speed of 900 R. P. M.

Apparatus No. 2, for the assembly room supply, is a single inlet, single width, to horizontal discharge full-housed fan running at 260 R. P. M. This fan has a capacity of 22,000 cu. ft. per minute, and is belt-driven by a 10 H. P. motor, having a synchronous speed of 900 R. P. M.

EXHAUST FANS.

Apparatus No. 3 (north side classroom exhaust fan) is a single inlet, single width, top vertical discharge, full-housed fan, running at 240 R. P. M., and having a capacity of 22,000 cu. ft. per minute. The fan is belt-driven by a 7½ H. P. motor, with a synchronous speed of 900 R. P. M.

Apparatus No. 4 (south side classroom exhaust fan) is a single inlet, single width, top vertical discharge, full-housed fan, running at 260 R. P. M., with a capacity of 24,000 cu. ft. per minute. A 10 H. P. motor is used with this fan, belt-connected, having a synchronous speed of 900 R. P. M.

Apparatus No. 5 is the assembly room exhaust fan, and is a single inlet, single width, top vertical discharge, full-housed unit, running at 235 R. P. M. and having a capacity of 22,000 cu. ft. per minute. It is belt-driven by a 7½ H. P. motor, with a synchronous speed of 900 R. P. M.

Apparatus No. 6 is the exhaust fan for the toilet rooms. This is a single inlet, single width, top vertical discharge, full-housed fan, running at 480 R. P. M. and delivering 4,500 cu. ft. per minute. It is belt-driven by a 2 H. P. motor, with a synchronous speed of 900 R. P. M.

All of the air-tempering heaters, preheaters and re-heaters are of the Vento type. The sections are of the regular pattern, 40 in. high and spaced 5 in. on centers. They are erected in a vertical position and assembled in groups as follows:

		Class Room System. Apparatus No 1.		Auditorium System. Apparatus No. 2.	
	Temp.	Preheater	Reheater	Temp.	Reheater
No. groups high	2	2	2	2	2
No. groups wide	2	2	2	1	1
No. groups deep	2	1	1	2	2
No. groups total	8	4	4	4	4
No. sections per group	16	16	16	16	16
No. sections total	128	64	64	64	64
Sq. ft. heating surface	1376	688	688	688	688
Steam connections per group	2½	2	2	2½	2
Return connections per group	1½	1¼	1¼	1½	1¼

The two-air washers which are included in the equipment are of the Carrier type, and have capacities of 40,000 and 22,000 cu. ft. of air per minute, respectively, with a velocity of air through any part of the washer of not over 500 ft. per minute. Each washer is provided with a system of humidity control arranged for maintaining a constant relative humidity in the rooms throughout the winter. The washers are guaranteed to remove not less than 98½% of the solid matter entering the apparatus, to saturate the air leaving the apparatus when the air is heated in the washer; to maintain a relative humidity of 50% or less to 30% in the building when the room temperature is maintained at 70° F. during weather below 50° F. outside; and to cool the air in summer, when recirculating the water over and over again, through a range of temperature equal to 75% of the difference between the entering wet and dry bulb temperature.

The architects of this building are Ingham & Boyd, Pittsburgh. The engineers are the Richard B. Kimball Co., New York. The contractors for the heating and ventilating work are G. F. Higgins Co., Pittsburgh, Pa.

The Investigation of the Physical Conditions of a Room

DESCRIPTION OF NEW APPARATUS DESIGNED TO MEASURE HEAT LOSSES, ORGANIC IMPURITIES IN AIR AND FOR MAINTAINING UNIFORM TEMPERATURES IN EXPERIMENTAL ROOMS.

BY A. H. BARKER.

(*Abstract of paper read at the annual meeting of the Institution of Heating and Ventilating Engineers, London, February 9, 1914.*)

The author said that in previous papers he had expressed the opinion that experimental means of investigating the physical conditions of a room were very defective; the knowledge of the transmission co-efficients of building materials was likewise defective, and the figures in current use considerably in error. He had also previously explained why it was difficult to get accurate figures for that purpose, and had detailed what he regarded as the features in room air which produced feelings of comfort, and the healthful climate which, in his view, it should be the object of all heating and ventilating engineers to produce. The paper continued:

As far as health is concerned, and perhaps comfort as well, all the physical conditions which go to produce a satisfactory climate should be within the purview of the heating engineer. His object should be less to heat the room and less to change the air in it than to produce a "good climate." Warming a room and changing the air in it are to be regarded as only among the means to effect such an end.

THE WORD "CLIMATE" NOT SATISFACTORILY DEFINED.

The word "climate" has not been satisfactorily defined. We all know what it means in a general way, but nobody seems to know what it means in a specific way. The doctors who talk learnedly on the subject of different climates probably in many cases have very hazy notions what is the physical difference between, say, the climate of Hastings and that of Buxton, taking the names of two health resorts at random. The difference in temperature may be negligible, the differences in pressure practically none, the differences in purity of air non-existent—or at least indistinguishable by chemical analysis. The differences in mean wind velocity may be little or nothing; the quantity of ozone in the air probably does not differ as between the two places by the millionth part of one per cent. The humidity may be identical. In spite of such identities, doctors gravely pronounce in favor of one or the other climate as being preferable in the case of a disease whose nature they possibly understand as little as they understood the climate.

ELEMENTS OF ROOM CONDITIONS.

It is with the object of attempting to define some of the features in room conditions which go to make up the *tout ensemble* of satisfactory or unsatisfactory heating or ventilation, that the writer has been endeavoring to devise instruments for analysing the various conditions of room air. He said he regarded the elements of room conditions which need to be considered as the following:

(1) The air temperature.
(2) The mean radiant temperature.
(3) The carbonic impurity.
(4) The organic impurity.
(5) The quantity of dust.
(6) The extent and velocity of the air currents and their general direction.

To these might perhaps be added (7) The electrical condition of the air in the room. He was not inclined to attribute any considerable importance to the amount of ozone in the air.

APPARATUS TO MEASURE HEAT LOSSES.

The first instrument described by the author was one erected in the laboratories at University College, but which he had not had time to take a complete set of readings from, owing to it having only recently been completed. The apparatus has a double object; first, the determination of the rate of loss of heat through walls and windows—that is, the co-efficient known as "K"; second, the total loss of heat from the room in which the apparatus was placed.

It is an automatic apparatus, the prin-

ciple of which is similar to the guard-ring method of determination of absolute conductivity of a plate of solid substance. In this method a certain area of each side of the plate under test is isolated by an enclosure termed a "guard ring." A measured quantity of heat is supplied to the interior of one guard ring by a method which enables the amount of heat to be accurately determined, provision being made that the heat which escapes from the guard ring can not escape in any other way than through the enclosed area of plate.

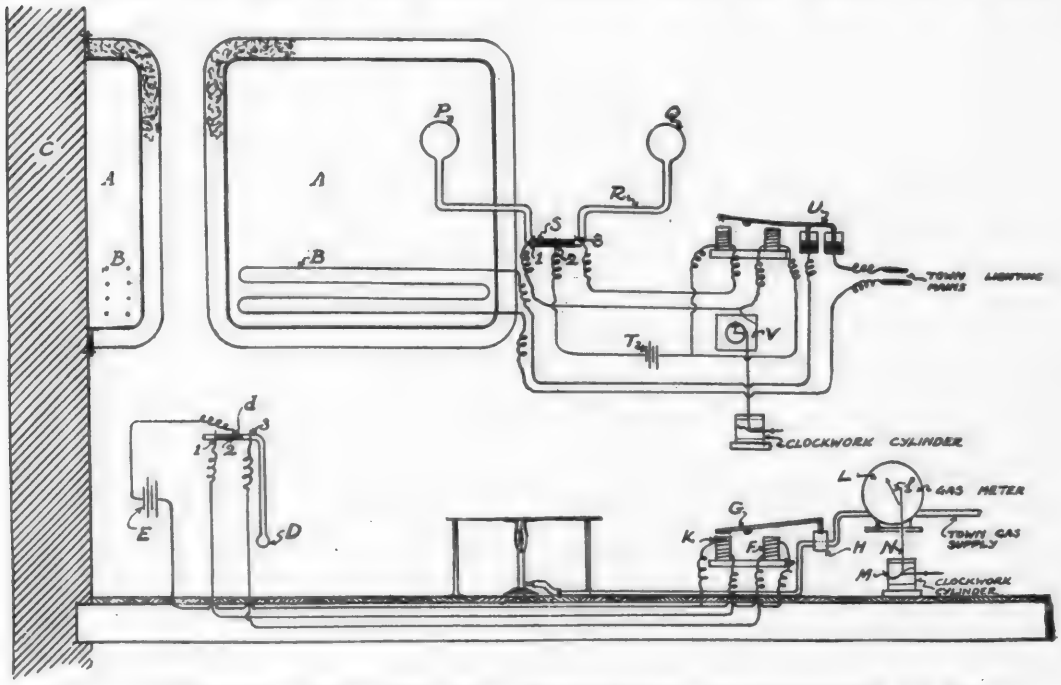


FIG. 1.—BARKER'S APPARATUS FOR DETERMINING COEFFICIENTS OF HEAT TRANSMISSION FROM ROOMS.

A—Chamber.
B—Electrical resistance coils.
C—Wall.
D—Electrical thermometer.
d—Thread of mercury.
E—Battery.
F—Electro magnet.
G—Armature.
H—Gas Cock.
K—Electro magnet.
L—Gas meter.
M—Recording instrument.
I—Crank.
N—Connecting rod.
P—Air thermometer.
Q—Air thermometer.
R—Glass tube.
S—Mercury thread.
T—Electrical battery.
U—Switch.
V—Electricity meter.

ARRANGEMENT OF EXPERIMENTAL CHAMBER FOR DETERMINING HEAT LOSSES.

The author's method for the determination of "K" is exactly similar in general outline. He showed on the screen a large diagram of a rectangular chamber, open at one side and carefully protected against loss of heat on all the other sides. It is formed of an iron frame covered with the best non-conducting materials, and made as airtight as possible by glazed paper and varnish. It is bolted to a wall, the area covered being exactly 10 sq. ft. Inside this chamber a number of specially made low-temperature electrical resistance coils are fixed.

It was required to determine what amount of heat would escape from the chamber when the interior of it was maintained, say, 30° above the temperature of the external air. If the interior of the room outside the chamber is maintained at precisely the same temperature as the interior of the chamber, the author said it is evident there will be no loss of heat from the room into the chamber, or vice versa, because the temperatures of the two sides are the same.

If the room is maintained at exactly 30° above the outer air by independent means, such as radiators or gas flame, or otherwise—the means making no differ-

ence—then, if the interior of the chamber is maintained at exactly the same temperature as the room, it ensures that whatever heat is supplied to the inside of the chamber can only escape through the wall. This heat is supplied to the interior by electrical means, and if the total number of units supplied to the interior of the chamber in any given time is measured accurately, the amount of heat lost in that time through the wall is thereby determined, with a given difference of temperature.

That, said Mr. Barker, is the fundamental basis of the instrument. The appliances coupled with it are merely the automatic means for securing the uniformity and identity of temperature which is necessary within and without the chamber. As arranged in the laboratory, the means for maintaining the room at a constant temperature is by burning gas and controlling the supply of gas by an electrical thermometer, which turns on the gas when the temperature falls a fraction below the desired temperature, and turns it off when the temperature rises above that level.

UNIQUE ELECTRIC THERMOSTAT FOR MAINTAINING CONSTANT ROOM TEMPERATURE.

This is effected by an apparatus working on the following principle: The thermometer is an alcohol one very carefully made; at the top of the column there is a thread of mercury, which is pushed along the tube by the expansion of the column of alcohol and pulled back by its contraction. In the tube there are three platinum wires fused, numbered 1, 2, 3. The thread of mercury is long enough to make electrical contact between 1 and 2 or between 2 and 3, but just too short to make contact between 1 and 3.

When the temperature is exactly 60°, or any other temperature for which the thermometer is constructed, the mercury thread lays evenly between 1 and 3, but is not in contact with either. When the temperature rises a fraction of a degree, the mercury thread is pushed along the tube a small distance, so as to make contact between wires 1 and 2. This puts into circuit a battery, which is so coupled up as to energize an electro-magnet, which pulls down an armature and closes the gas cock. When the temperature falls the mercury thread is moved to the right, and shuts off contact between 1 and 2, making contact between 2 and 3. This energizes another electro-magnet, which attracts the armature and opens the gas cock, so turning on the gas and heating up the room. The gas passes through a meter coupled to a recording instrument, which marks on a chart the amount of gas consumed at any given time. This is accomplished by fixing a small crank on one of the spindles of the meter, and coupling the crank-pin by a connecting-rod to a pen, which traces a wavy line on a cylinder, with vertical axis, which is rotated by clockwork.

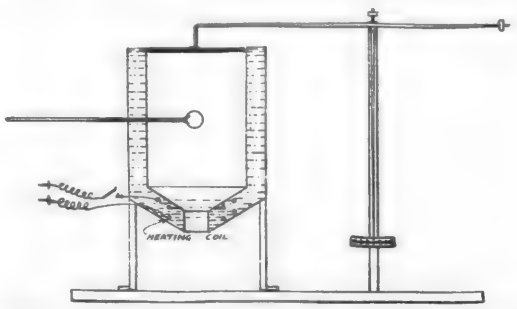


FIG. 2.—BARKER'S AIR THERMOMETER, ARRANGED TO ELIMINATE EFFECT OF SURROUNDING SURFACES.

By this means the amount of gas consumed up to any point of time can be exactly determined, and knowing the calorific value of the gas, the total heat lost from the room is given accurately. The readings on the curve give what might be called a by-product of the experiments—namely, the heat lost from the room during the time under consideration.

MEANS FOR MAINTAINING INTERIOR OF CHAMBER AT SAME TEMPERATURE AS ROOM.

The next part of the apparatus consists of means for maintaining the interior of the chamber at exactly the same temperature as the room. This is secured by fixing in the chamber a large air thermometer, another one being fixed in the room itself. The two are coupled together by a glass tube, in which a thread of mercury separates the air in the two thermometers. When these are at exactly the same temperature, the thread of mercury occupies a mid-position; but if either air bulb is at a higher

temperature than the other, the pressure in the bulb at the higher temperature rises and forces the mercury thread along the tube. In this latter are three electrical contacts, fused at such a distance apart that the mercury thread can make contact between the centre one and either of the outer ones, but is not long enough to make contact between all three. So that when one bulb is hotter than the other, the mercury thread is forced along the tube in the direction of the latter, making electrical contact between wire 2 and wire 3. And, vice versa, when the latter bulb is hotter than the former, contact is automatically made between Nos. 1 and 2.

In the former case an electrical battery is brought into operation, this actuating an armature similar to the one already described, which cuts out the main electrical current by the switch from the resistance fixed inside the chamber. When, on the other hand, the first thermometer falls in temperature, another electrical circuit is energized, and the corresponding electro-magnet pulls the main current into circuit with resistances in the chamber. These are thereby made warm, and the temperature in the chamber is again slightly in excess of the room temperature, when it is once more automatically cut out. Thus the readings of the electricity meter give an accurate measure of the amount of heat supplied to the interior of the chamber. A graphic record is kept of the reading of the electricity meter by a clockwork-device precisely similar to that already described.

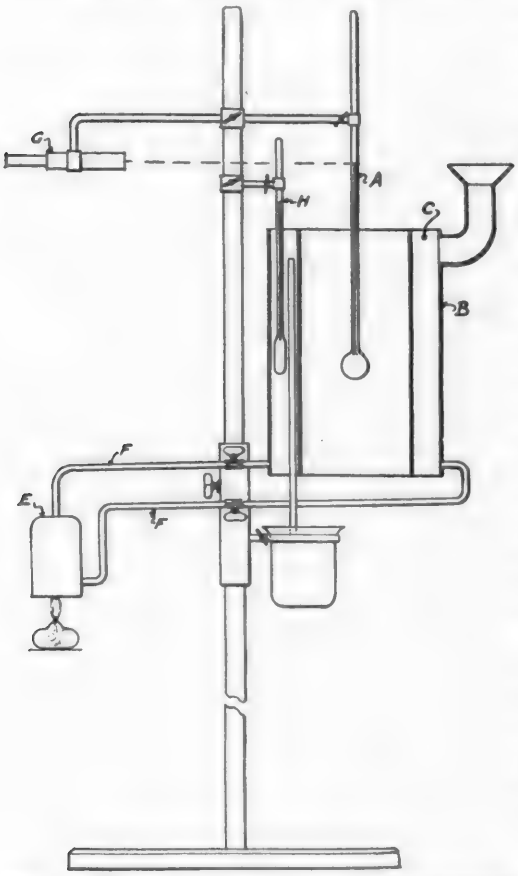


FIG. 3.—APPARATUS FOR DETERMINING RADIANT TEMPERATURE.

AUTOMATIC OPERATION OF APPARATUS.

As explained, the only way in which the heat can get out of the chamber is through the 10 sq. ft. of wall, and the means are purely automatic. It is only necessary to switch on the electrical contacts and light the gas and the apparatus can be left for a whole day at a time, and will automatically record the heat used in warming up the room and that portion of the heat which passes through the 10 sq. ft. of wall which is under observation. Results of experiments with this apparatus, said the speaker, would be laid before the Institution in due course.

The difficulty with the apparatus is, of course, to get a period during which the outside temperature is sufficiently constant for such a length of time as to give reliable readings. The temperature of the coils should be kept fairly low so as to avoid the danger of losing heat by radiation. Holes of different depths are made in the walls in which are kept thermometers, and by this means the temperature gradient in the substance of the wall is arrived at, while it is possible to mask any radiation there might be from resistance. While these observations are going on, measurements can be made of the carbonic acid impurity in the air by means of Haldane's apparatus, and by suitable calculations the amount of air interchange going on in the room can be determined.

DIFFICULTY OF DETERMINING RADIANT TEMPERATURES.

The author went on to say that he had discussed the question of the radiant temperature in a room in one of his lec-

tures at the University College, when he described the apparatus he had devised to determine such temperature, as well as the air temperature. The difficulty of determining the latter is due to the fact that a thermometer hung in a room is partly influenced, through radiation, by the temperature of its surroundings as well as that of the air. If it is attempted to shut off this radiation from the surroundings by means of a hollow cylindrical metal screen surrounding the thermometer, this metal screen itself will be under the same influences as the bulb of the thermometer; in other words, it is subject partly to a gain or loss of heat by contact of air, and partly to a gain or loss of heat by radiation; so that whatever temperature the screen takes up, it is merely an image of the temperature which the thermometer would have taken up if the screen had not been there.

It is useless, therefore, for acting as a screen, and there is no guarantee that the thermometer when surrounded by such a screen will register the temperature of the air itself, when it is also under the influence of the screen as well; indeed, facts show that such will not be the case.

A thermometer, in fact, can not be guaranteed to register the temperature of the air in any circumstances, except those in which it is surrounded by surfaces at the same temperature as the air itself. When this is the case the thermometer is under no influences other than those which influence it to register the same temperature as the air. The problem, therefore, becomes reduced to that of surrounding the thermometer with a screen, the temperature of which can be independently varied and made the same as that of the air; and some means of determining the point at which the air in the centre of the screen is at the same temperature as the air surrounding it.

APPARATUS FOR DETERMINING ORGANIC IMPURITIES IN AIR.

Mr. Barker proceeded to describe another apparatus devised for determining the amount of organic impurity in the air of a room or hall, the principle of which is to draw through a tube a measured quantity of the air of a room by means of a small electrically-driven pump, working through a small gas meter. In this combustion tube there is a platinum wire, which is kept at a red or a white heat by means of an electrical current passing through it, or platinum block, or other powerful oxidizing agent, so that the whole of the organic products in the sample of air are oxidized or burned up.

The air and the products of combustion are then "bubbled" through a spiral tube containing a chemical solution which absorbs all the carbon dioxide generated. The amount of CO_2 existing in the tube is then measured by titration—that is, by dropping into the liquid a carefully-measured quantity of a chemical solu-

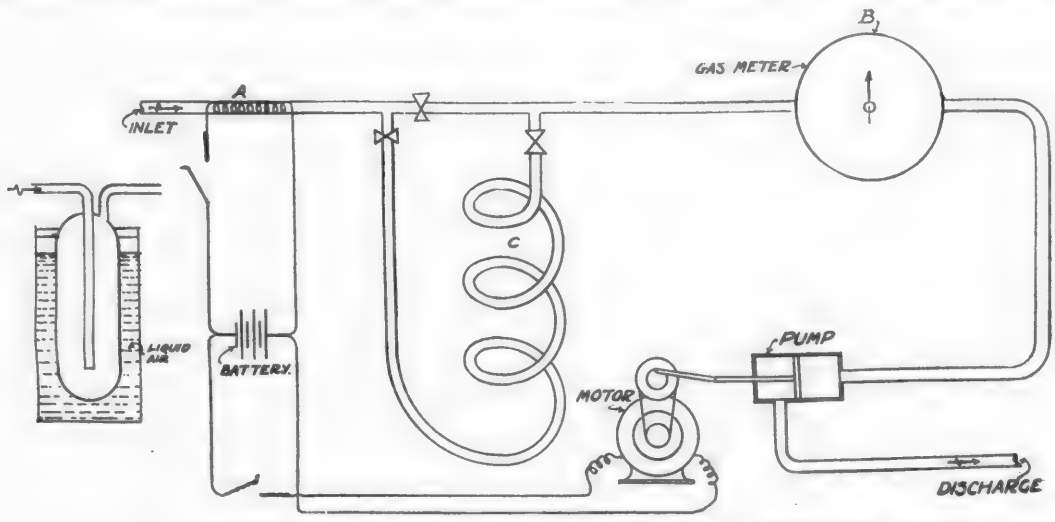


FIG. 4.—APPARATUS FOR DETERMINING ORGANIC PRODUCTS IN AIR.
A—Tube. B—Gas meter. C—Spiral tube.

tion which neutralizes the CO_2—and an indicator which shows exactly when the whole of the carbon dioxide has been neutralized.

The chemical used for absorbing the CO_2 is barium hydroxide, and the liquid used for titrating is a standard solution of oxalic acid. When a standard solution is made up, every cubic centimeter of the standard solution corresponds to a definite quantity of CO_2. By trying how much oxalic acid is necessary to neutralize exactly the CO_2 in the solution, it is possible to determine accurately how much CO_2 there is in the measured quantity of air drawn through the apparatus.

It is evident that this observation should determine with some accuracy the total amount of carbon dioxide in the sample after it has been burnt. It is necessary, therefore, to subtract from this reading the amount of CO_2 which is shown to be present in the air by the use of the Haldane apparatus before the combustion takes place. The actual amount of carbon in the existing example of air as organic products and organic dust will be the difference between these two quantities. It is not possible by these means to determine what is the character of the organic compounds.

A modification of the apparatus, suggested by Professor Norman Collie, and which is now being made, is to draw the air to be tested through a tube surrounded by liquid air, thus cooling it to such an extent as to condense everything in it except the oxygen, nitrogen and hydrogen, and analyze the resulting mixture. This method may be expected to give a much more accurate result than the preceding one.

Mr. Barker said that he also had in course of construction an apparatus for determining the number of dust particles in a sample of air, and for determining the electrical condition of the air; as well as a very delicate apparatus for detecting the magnitude and direction of drafts and air currents.

Modern Practice in Shop Heating

NEW IDEAS, WITH ENGINEERING NOTES FROM A FAN ENGINEER'S DATA BOOK.

BY F. R. STILL.

(Presented before the Detroit Engineering Society, Detroit, Mich., March 20, 1914.)

What system of heating is best adapted for the shop is frequently an important question. There are all kinds of methods —some good, many poor and a large number positively bad. It is not my intention to analyze the merits and demerits of the various systems, but to point out the advantages obtainable with a good system of heating, and to explain how it should be laid out, installed and operated to secure the best results.

There are instances arising every day which prove conclusively that the heating plant has a positive and direct influence on the quality and quantity of the output. It does not require exceptional abilities for observation or analysis to discover this. Which plant is it that grows the faster—one with poor and antiquated equipment or one which has everything up to date? Which one of the two would make the better impression upon you? Did you ever find salamanders or stoves in a pushing, growing, up-to-date plant?

Those who recognize the advantages of a good heating plant frequently do not realize the necessity for designing it when the plans of the building are being made. The result is, that instead of arranging other things of much less importance to accommodate the heating plant, the latter has to be contorted, cut down, or squeezed into whatever space is available after everything else is taken care of. This makes the plant either expensive to install or to operate, and often it is so contorted or dwarfed in one way or another as to fail to give the satisfactory results naturally expected.

When it comes to laying out a heating

PENT HOUSES ON ROOF OF FORD MOTOR CO.'S PLANT, FORD, ONT., CONTAINING HEATING APPARATUS, ALSO MAIN DUCT AND BRANCHES WHICH CONNECT WITH INTERIOR COLUMNS.

plant, the character of the building and the purpose for which it is built must be carefully studied. What serves very nicely in a building of a certain type, in which a particular class of work is done, proves anything but satisfactory in a building of the same type, in which a different kind of work is done.

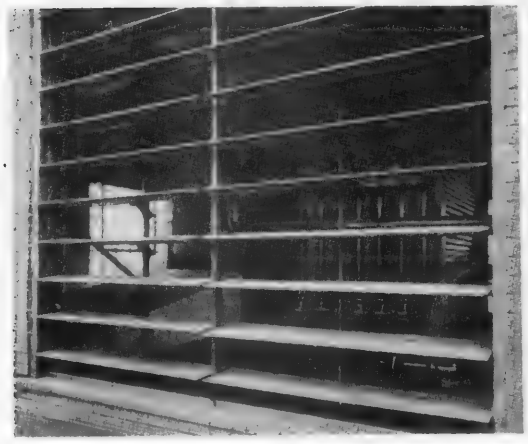
MACHINE SHOP AND PAPER MILL COMPARED.

This can be made clear by comparing a machine shop with a paper mill. They are similar in size, shape and exposure. In the machine shop no steam or moisture is emitted to condense on the walls and roof; hence many of them are heated in a fairly satisfactory manner by direct radiation, consisting usually of steam coils strung around the outside walls. Such a system would never do in a paper mill, where every day several tons of water are thrown off into the atmosphere in the form of steam from the drying cylinders over which the paper passes. This steam must be taken up by a copious circulation of warm, dry air, or it will drip from the roof and run down the walls.

Again, in a shoe factory, shirt, glove, cap or other manufacturing plant where hundreds of employes are assembled in one room, the air very soon becomes unfit to breathe; it produces a dull, languid feeling, which saps all the vitality and ambition of the employes, makes them inert, forgetful, careless, subject to severe colds and other disabilities, all tending to make them irregular in their attendance to their duties. To overcome this the building must be well ventilated, and the ventilation of a building in the winter time

Warm Air Outlets

VIEW IN FORD MOTOR COMPANY'S CANADIAN PLANT, SHOWING REGISTERS ON COLUMNS THROUGH WHICH AIR IS ADMITTED.



ONE SET OF APPARATUS WITHIN PENT HOUSE, ALSO LOUVRE DAMPERS.

must be considered in connection with the heating system.

CONDITIONS IN FOUNDRIES.

Foundries are much like the paper mills just cited, as the steam rising from the moulds when pouring off, as well as the smoke and noxious gases, should be removed. Roof ventilators, monitor lights or ventilating sashes are very poor makeshifts indeed. Perhaps they will let some of the smoke escape, and with it some of the gases and most of the heat; but most of the gases, being heavier than the air, lie in the lower strata near the floor and are not affected by the roof vents. Further, instead of removing the steam, they only accelerate the annoyance from it, as the warm air which escapes through the roof must be supplanted by outside air, and this, not being properly heated, chills the air within the building, thus reducing its capacity to carry moisture, thereby causing greater precipitation than there would be were no attempt made to ventilate the building.

TENDENCY OF MODERN CONSTRUCTION.

Then, again, apart from the use to which the buiding is put, consideration must be given to its character.

The tendency nowadays is to put up lofty buildings. Such structures have steel frames, walls made almost entirely of glass, with only narrow pilasters between, and shallow panels of brick or concrete above and below the openings. The exposures are relatively enormous, requiring large amounts of heating surface, yet the space available for steam coils are limited to such an extent that they are often insufficient for the heating surface required.

Furthermore, when the space is sufficient, the banking of such great heating surfaces into a small space makes it uncomfortable for the employes who have to work near them.

It is these and many other features that have made the blower system popular, as it has proved efficacious in almost every building of whatever character, when it has not been misapplied. Many of the designers of such heating plants seem to have a penchant for trying to make this system do all sorts of unusual and almost impossible "stunts." The system is so flexible and so positive in its action that many persons seem to think it capable of defying Nature's laws. But occasionally Nature asserts her rights in a most emphatic manner, with the result that a plant fails to do what was expected of it. This, however, is no fault of the system, but rather of the man who designed the plant.

ARRANGEMENT OF DUCTS IN INDUSTRIAL PLANTS.

The prevailing practice in industrial plants is to make the ducts of galvanized sheet iron for all types of buildings, except where it is necessary to place them underground, in which case they are built of brick, vitrified tile or reinforced concrete.

It is always advisable to run the ducts inside the building because of the heat wasted if they are run outside, be they above or below the ground. It is, furthermore, advisable to make the ducts of galvanized iron and suspend them in the open air overhead, if possible, as the loss of heat from underground ducts is enormous.

The average modern shop has a trussed roof, the bottom chords of which are often 30 to 50 ft. above the floor. The ducts have to rest on these trusses, and it is impossible to drive air from them down to the floor in a way that will produce satisfactory results. This method has been tried often enough, but there still remain others who must be convinced of its impracticability by trying it themselves. The only way to obtain an

even distribution of heat is to discharge heated air at such points as it is most needed and where the effect will be most appreciated.

To distribute the heat evenly necessitates running the ducts to all cold spots; it is needed the most in the lower strata near the floor, not up among the roof trusses; the greatest benefit is derived from the system by discharging the warm air close to the floor, keeping the lower strata in circulation and thereby warming it by mixing with the warm air discharged from the ducts.

The best way to bring this about is to extend the branch ducts from the main trunk line over to the walls or to posts not more than 20 ft. away from the outside walls, then down toward the floor, ending 4 or 5 ft. from the floor. The air should discharge directly toward the floor or at only a slight angle from perpendicular. This method will be found most effective in machine shops, foundries and other lofty structures.

DIFFERENT ARRANGEMENT NECESSARY WHERE CONDENSATION IS LIKELY TO COLLECT ON UNDER SIDE OF ROOF.

In paper mills, rubber works, dye houses and other plants for which the building is of the same type as those just noted, it is necessary to blow some hot air out towards the roof as well as down towards the floor, in order to take care of the condensation which would otherwise collect on the under side of the roof. Even then, in very cold climates, it is sometimes necessary to put in a false ceiling to overcome this annoyance, unless hoods are provided to remove the vapor immediately, and particularly if the roof is built of a material which is a good conductor of heat.

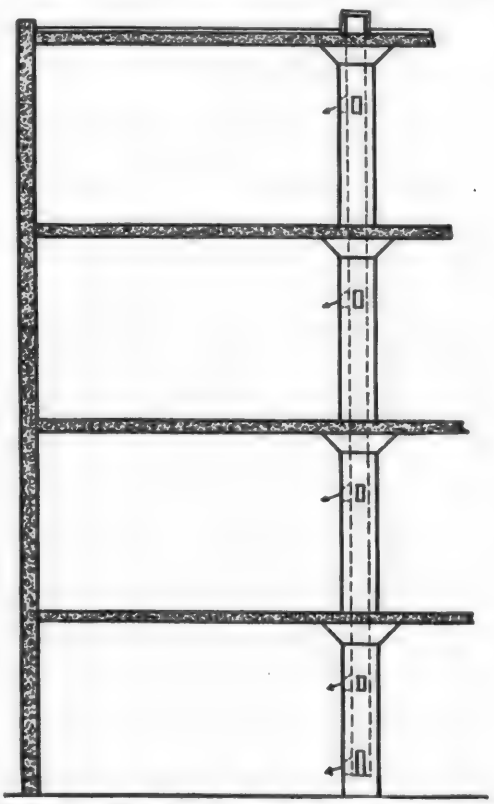
For buildings which are several stories in height, each story being from 10 to 16 ft. high, the treatment should be different. With them it is possible, and sometimes advisable, to introduce the air near the ceiling, blowing downward at an angle of 30° to 45° from horizontal.

Frequently buildings of this character are quite effectively heated from one or two galvanized iron stand pipes run up through the middle of the building, with outlets into each story. This method is practical in buildings not over 60 ft. wide; if the building is not over 100 ft. long, one riser will be sufficient.

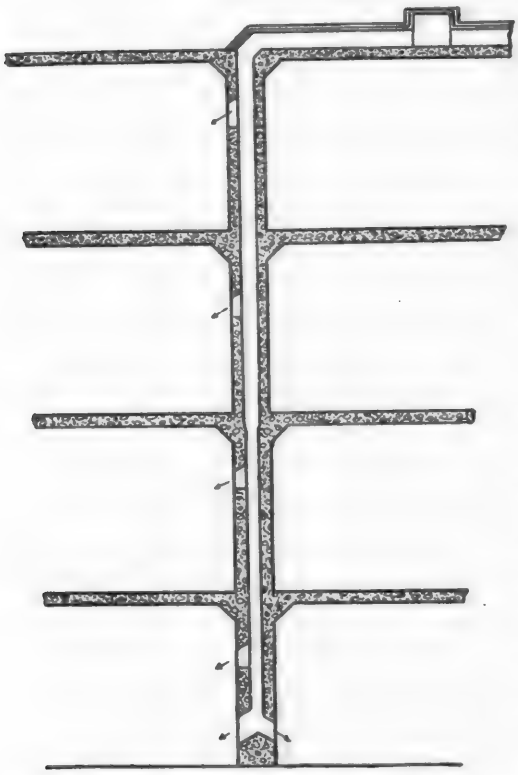
WARM AIR FLUES ON OUTSIDE FACE OF PILASTERS.

For cotton, woolen, silk and other textile mills, it has become almost the universal practice to build vertical warm air flues on the outside face of the pilasters, on both sides of the building. These flues usually have a 2-in. air space built into the brick work to insulate them. The air is admitted to each story about 8 ft. above the floor. Deflecting "Mill" dampers" regulate the volume of air discharged through each opening. The various flues can be supplied at their base from a main duct built either of masonry or galvanized iron.

For manufacturing plants, it is customary to make the trunk line ducts of such an area as will convey the required volume of air at a velocity varying from 1,500 to 2,400 ft. per minute. In high buildings used for heavy and coarse work, where most of the employes stand or move about considerably, the velocity



VERTICAL SECTION SHOWING COLUMNS IN ELEVATION WITH OPENINGS INTO EACH STORY.



VERTICAL SECTION THROUGH ONE OF COLUMNS SHOWING AIR DUCT IN CENTER, WITH OUTLETS INTO EACH STORY.

can be much higher than in shops divided into several stories or those in which the work is more or less sedentary, like the manufacture of shirts, gloves, etc., where the employe sits all day, simply feeding the material into machines.

Air currents or drafts are of no material moment in the former shops, while in the latter they will produce great discomfort. Therefore, the latter class should have the main ducts of sufficient area to keep the velocity down to 1,200 to 1,500 feet per minute, and the branches should be proportioned to a velocity of 600 to 900 ft.

Another advantage the blower system possesses, infrequently brought to notice, is the cooling and comforting effect it has in oppressively warm weather in summer time. Simply running the fan will, of itself, greatly relieve the oppressiveness, and when cold water is circulated through the coils the difference is very noticeable.

BEST TEMPERATURE IN COLD WEATHER.

There is often a wide variation of opinion as to the best temperature to maintain in cold weather. As a general proposition, in foundries and other buildings where the work is active and somewhat vigorous, a temperature of 50° to 55° F. is sufficient. In machine and woodworking shops, it should be from 60° to 65° F. In shoe, clothing and other factories employing help where the work is more or less sedentary, the temperature should be 68° to 72° F.

FIGURING REQUIRED HEATING SURFACE.

The basis for determining the amount of heating surface is the most difficult point to settle. In nothern climates, the outside temperature occasionally drops down to 10° below zero, and in Minnesota, Dakota and Montana it goes even lower than 30° below zero. If a plant is designed for these extremely low temperatures it is too large for the conditions prevailing for 95% of the year. It therefore becomes a question of very fine judgment as to just what should be the basis upon which to figure. The following table will give a fair idea of what the resulting temperatures will be under the varying outside atmospheric conditions, the basis being zero:

From the table it will be noted that for climates where the temperature does not

RESULTING INDOOR TEMPERATURES UNDER VARYING OUTDOOR CONDITIONS BASED ON 0° F.

Class of Building	Temp. in Degrees F. Desired Inside, Outside 0° F.	Resulting Inside Temperature, Deg. F. Temp. Outside −30° F.	Temp. Outside -20° F.	Temp. Outside −10° F.	Temp. Outside +10° F.	Temp. Outside +20° F.	Temp. Outside +30° F.
Foundries	50	22	32	41	57	63	70
Machine shops	60	34	43	52	67	73	78
Clothing shops	70	45	55	63	76	81	86
Paint shops	80	59	67	74	85	89	92

drop below 10° F., an inside temperature based on zero outside gives very fair average results; but for climates where the temperature may be from 30° to 20° for several days at a time, the basis is not low enough. For such cases, if the basis is zero, the resulting temperatures should be figured about ten degrees higher than normal or the temperature in the table given for machine shops should be taken for foundries, and the temperature for clothing shops should be taken for machine shops.

On the other hand, if the coldest temperature ever reached is zero, and the protracted cold spells are usually at outside temperatures of from 10° to 20° above zero, the basis for determinating the size of the plant in zero weather would be 40° at zero for foundries, and then taking the tabulated temperatures of foundries for machine shops and so on.

In this way considerable unnecessary expense can be saved in the initial cost of the plant; it will be smaller and hence much less costly to operate. It is all well enough to argue that the steam can be cut down on the heating coils and the speed of the fan reduced when the weather conditions moderate, but this is usually not done, simply because it is nobody's business to see that it is done, and instead of thus economizing in the cost of operation, one will invariably find the shop windows and doors open when it becomes too warm inside.

Therefore, the more nearly the size of the plant conforms to the needs during average weather conditions, the less it will cost to operate it, and this can only be brought about by settling first on what temperature will be satisfactory for the few days of extremely cold weather. This applies to any heating system, and, if anything, should be given greater weight for any other than the blower system, as no other can be so readily adjusted to varying weather conditions.

With the lower system one or more sections can be cut out of the heating coils and the lower slowed down in moderate weather; or, steam at a higher pressure can be turned into the coils and the fan be driven at maximum speed for extremely cold weather.

DETERMINING THE HEATING PERIOD.

Another question often arising, which is sometimes quite important, is the determination of the heating period within a year. An average from the records for ten years in this vicinity gave the following results:

HEATING PERIOD FOR DETROIT, MICH.

0° to 10° F.	4	days	@	24	hrs.	per	day	equals	96	hrs.;	@	10	hrs.	equals	40 hrs
10° to 20° F.	10	"	"	"	"	"	"	"	240	"	"	"	"	"	100 "
20° to 30° F.	34	"	"	"	"	"	"	"	816	"	"	"	"	"	340 "
30° to 40° F.	61	"	"	"	"	"	"	"	1,416	"	"	"	"	"	610 "
40° to 50° F.	48	"	"	"	"	"	"	"	1,152	"	"	"	"	"	480 "
50° to 60° F.	53	"	"	"	"	"	"	"	1,270	"	"	"	"	"	530 "
Total hours		"	"	"	"	"	"	"	5,040	"	"	"	"	"	2,100 "

Heating and Ventilation Laws and Regulations in the United States

REQUIREMENTS OF RECENTLY-ENACTED AND OTHER LAWS NOW ON THE STATUTE BOOKS IN THE VARIOUS STATES.

(*Continued from March issue.*)

Ohio.

The Ohio State Building Code is being enacted into law in sections. In its entirety it is designed to regulate the construction of, repair of, alterations on and additions to public and other buildings and parts thereof; also the sanitary condition of public and other buildings, etc. The complete code applies to opera houses, halls, theatres, churches, school houses, academies, seminaries, infirmaries, sanitoriums, children's homes, hospitals, medical institutes, asylums, memorial buildings, armories, assembly halls or other buildings used for the assemblage or betterment of people in any municipal corporation, county or township in Ohio and refers to alterations as well as new work.

PORTIONS OF CODE NOW IN FORCE.

The portions of the code already passed by the Legislature are:

Part 1. Administration.

Part 2. (Title 1.) Theatres and Assembly Halls.

Part 2. (Title 3.) School Buildings.

Part 2. (Title 7.) Workshops, Factories and Public Buildings.

Part 1 contains the act providing for the administration of the code. In section 1 it is stated that "it shall be the duty of the chief inspector of workshops and factories or building inspector, or commissioner of buildings in municipalities having building departments to enforce all the provisions herein contained for the construction, arrangement and erection of all public buildings or parts thereof, including the sanitary condition of the same, in relation to the heating and ventilation thereof."

In Section 5 it is stated that "nothing herein contained shall be construed to limit the control of municipalities from making further and additional regulations not in conflict with any of the provisions of this act contained nor shall the provisions of this act be construed to modify or repeal any portions of any building code adopted by a municipal corporation and now in force which are not in direct conflict with the provisions of this act."

Section 6 states that "the provisions of this act shall not apply to the construction or erection of any public buildings or to any addition thereto or alteration thereof, the plans and specifications of which have been heretofore submitted to and approved by the chief inspector of workshops and factories. The provisions of this act shall not apply to the construction, erection or equipment of any public building, addition thereto or alteration thereof, the contract for the construction, erection or equipping of which has been let or entered into prior to the date at which this act takes effect."

Failure to comply with the act constitutes a misdemeanor and is punishable by a fine up to $1,000.

As already stated, the special requirements for the design, construction and equipment of the buildings referred to are contained in Part 2. The buildings are classified as follows:

Title 1. Theatres and assembly halls.

Title 2. Churches.

Title 3. School buildings.

Title 4. Asylums, hospitals and homes.

Title 5. Hotels, lodging houses, apartments and tenement houses.

Title 6. Club and lodge buildings.

Title 7. Workshops, factories and mercantile establishments.

Buildings or parts of buildings used only for the specific purposes mentioned under their respective title and classification shall be designed, constructed and equipped as called for under such title and classification. Buildings used for two or more different kinds of occupancy and combining the classifications covered under two or more different titles shall be designed, constructed and equipped according to all of the various sections of the different titles affecting such buildings or parts of such buildings.

TITLE 1 (PART 2).—THEATRES AND ASSEMBLY HALLS.

Under the classification "theatres" are included all buildings or parts of buildings in which persons congregate to witness spectacular, vaudeville, burlesque, dramatic or operatic performances, or other buildings or parts of buildings in which scenery is used, or in which motion pictures are thrown upon canvas, screens or wall.

Under the classification of "assembly halls" are included all buildings or parts of buildings in which persons are assembled for entertainment or amusement, including halls

used for lodge rooms or dancing, and, all places where persons congregate to witness vaudeville, burlesque, dramatic or operatic performances, to hear speakers or lecturers, to listen to operas, concerts or musical entertainments in which no scenery is used and no motion pictures are thrown upon canvas, screens or walls, and seating or accommodating 100 or more persons.

* * *

SECTION 8. (HEATER ROOM.) Furnaces, hot water heating boilers and low pressure steam boilers may be located in the buildings, providing the heating apparatus, breeching, fuel room and firing room are inclosed in a standard fireproof heater room and all openings into the same are covered by standard self-closing fire doors.

No boiler or furnace shall be located under the auditorium, stage, lobby, passageways, stairways, exits of a theatre; or, under any exit, passageway or lobby of an assembly hall. No cast iron boiler carrying more than 10 lbs. pressure or steel boiler carrying more than 35 lbs. pressure shall be located within the main walls of any theatre or assembly hall.

* * *

SECTION 30 (HEATING AND VENTILATING).—A heating system shall be installed which will uniformly heat all parts of the building to a temperature of 65° F. in zero weather.

All parlors, retiring, toilet and check rooms, and all assembly halls used in connection with and a necessary adjunct to a church, school building, lodge building, club house, hospital or hotel shall be heated by an indirect system combined with a system of ventilation which will change the air not less than six times per hour. All other assembly halls and theater auditoriums shall be heated and ventilated by a system which will supply to each auditor not less than 1,200 cu. ft. of air per hour.

The system to be installed where a change of air is required shall be either a gravity or mechanical furnace system, gravity indirect steam or hot water, or a mechanical indirect steam or hot water system.

No stove or open grate shall be used in any theatre or assembly hall, except water heaters, furnaces and boilers.

No stove pipe shall be more than 5 ft. long, measuring horizontally, unless the same be enclosed in a standard fireproof heater room, nor shall any stove pipe come closer to any combustible material or ceiling than 3 ft.

The fresh air supply shall be taken from outside the building and no vitiated air shall be reheated. The vitiated air shall be conducted through flues or ducts to and be discharged above the roof of the building.

No floor register for heating or ventilating shall be placed in any aisle or passageway.

No coil or radiator shall be placed in any aisle or passageway used as an exit, but said coils and radiators may be placed in recesses formed in the wall or partitions providing no part of the radiator or coil projects beyond the wall line.

TITLE 3. SCHOOL BUILDINGS.

This applies to public and private schools, also libraries, museum and art galleries, and "all buildings or structures containing one or more rooms used for the assembling of persons for the purpose of acquiring knowledge, or for mental training."

The heating and ventilating of such "school buildings" is provided for in Section 21 as follows:

Section 21. Heating and Ventilation.—A heating system shall be installed which will uniformly heat all corridors, hallways, play rooms, toilet rooms, recreation rooms, assembly rooms, gymnasiums and manual training rooms to a uniform temperature of 65° F. in zero weather; and will uniformly heat all other parts of the building to 70° F. in zero weather. (Exceptions. Rooms with one or more open sides used for open air or outdoor treatment.)

The heating system shall be combined with a system of ventilation which will change the air in all parts of the building except the corridors, halls and storage closets not less than six times per hour.

The heating system to be installed where a change of air is required, shall be either standard ventilation stoves (Part 3, Title 10), gravity or mechanical furnaces, gravity indirect steam or hot water, or a mechanical indirect steam or hot water system. Where wardrobes are not separated from the class room they shall be considered as part of the classroom and the vent register shall be placed in the wardrobe. Where wardrobes are separated from the class rooms, they shall be separately heated and ventilated the same as the class rooms.

The bottoms of warm air registers shall be placed not less than 8 ft. above the floor line, except foot warmers which may be placed in the floors of the main corridors or lobbies.

Vent registers shall be placed not more than 2 in. above the floor line.

The fresh air supply shall be taken from the outside of the building and no vitiated air shall be reheated. The vitiated air shall be conducted through flues or ducts and be discharged above the roof of the building.

A hood shall be placed over each and every stove in the domestic science room, over each and every compartment desk or demonstration table in the chemical laboratories and chemical laboratory lecture rooms, of such a size as to receive and carry off all offensive odors, fumes and gases. These ducts shall be connected to vertical ventilating flues placed in the walls and shall be independent of the room ventilation as previously provided for.

Where electric current is available, electric exhaust fans shall be placed in the ducts of flues from the stove fixtures in domestic science rooms and chemical laboratories, and where electric current is not available and a steam or hot water system is used, the main vertical flues from the above ducts shall be provided with accelerating coils of proper size to create sufficient draft to carry away all fumes and offensive odors.

Blowers in workshops and factories, including rooms for manual training are taken up in General Code, State of Ohio, Section No. 1027.

Section 5 referring to Heater Rooms, states that "furnaces, hot water heating boilers and low pressure steam boilers may be located in the buildings, providing the heating apparatus, breeching, fuel room and firing room are enclosed in a standard fireproof heater room, and all openings into the same are covered by standard self-closing fire doors.

"No boiler or furnace shall be located under any lobby, exit, stairway or corridor.

"No cast-iron boiler carrying more than 10 lbs. pressure or steel boiler carrying more than 35 lbs. pressure shall be located within the main walls of any school building."

REQUIREMENTS OF THE DEPARTMENT OF INSPECTION OF THE INDUSTRIAL COMMISSION OF OHIO FOR THE HEATING AND VENTILATION OF PUBLIC BUILDINGS, HOSPITALS, ASYLUMS AND HOMES.

A special publication issued by the Department of Inspection of the Ohio Industrial Commission summarizes the requirements in the various classes of buildings, in part, as follows:

It will be noted that the provisions for the heating and ventilating of churches, asylums, hospitals and homes, are not statutory, because these requirements were not passed upon by the legislature when the State Building Code was enacted into law.

However, these provisions are legal since this department is given authority by law to examine and pass upon plans and specifications for buildings of this class and it is, therefore, necessary that the department adopt a code of regulations for the guidance of architects and engineers in preparing their plans and specifications, so that they may know what requirements will have to be met in order to secure the department's approval, which is required before building operations are commenced.

Classification.

A. Theatres.

Includes all buildings containing a stage with movable scenery or a motion picture machine.

B. Assembly Hall.

Includes all Assembly Halls or rooms, except Churches and Theatres.

C. Churches.

Includes all buildings used for Christian worship or religious instruction.

D. School Buildings.

Includes all Public, Parochial and Private Schools, Colleges, Academies, Seminaries, Libraries, Museums and Art Galleries.

E. Asylums, Hospitals and Homes.

Includes all buildings used for the detention, refuge, protection, treatment or care of the abandoned, homeless, infirm, helpless, blind, deaf, diseased in body or mind, incorrigible youths and felons.

(This classification does not include Hotels, Tenement Houses or Private Residences.)

Temperature.

A heating system shall be installed which will uniformly heat the various parts of the building to the following temperatures in zero weather.

Theatres and Assembly Halls.

All parts of the building, except storage rooms, to 65° F.

Churches.

Auditorium, social and assembly rooms, 65° F.

All other parts of the building, except storage rooms, to 70° F.

School Buildings.

Corridors, hallways, play rooms, toilets, assembly rooms, gymnasiums and manual training rooms, 65° F.

All other parts of the building to 70° F.

Hospitals, Asylums and Homes.

Operating rooms, 85° F.

All other parts of the building, except storage rooms, to 70° F.

Change of Air.

The heating system shall be combined with a system of ventilation which at normal temperature will change the air the following number of times or supply to each person the following number of cubic feet of air per hour:

Theatres.

Parlors, retiring, toilet and check rooms, 6 changes per hour.

Auditoriums, 1,200 cu. ft. of air per person per hour.

Assembly Halls.

When used in connection with a school building, lodge building, club house, hospital or hotel, six changes per hour; and in all other assembly halls, 1,200 cu. ft. of air per hour per person.

Churches.

Auditoriums, assembly rooms and social rooms six changes per hour.

School Buildings.

All parts of the building, except corridors, halls and storage rooms, six times per hour.

(To be continued.)

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IT IS perhaps, too early to judge of the effects of the recent trend of thought, as expressed by doctors and physiologists, on the design of mechanical equipment of buildings. The suggestions, it will be recalled, have ranged all the way from proposals for the opening of windows to those for the recirculation of the indoor air. Up to date, however, it is a matter of considerable significance how little departure has been made in so-called standard heating and ventilating practice. At a recent meeting of heating engineers plans were displayed of two of the latest types of school buildings, one in the East and one in the Middle West, both of which were remarkable for the completeness of their equipment, and both of which are equally remarkable for their strict adherence to the engineering standards of the immediate past. This applies not only to the matters of constant supply of warmed air at uniform temperatures for any given room or apartment, but to the methods of air supply and air removal based on the principle of downward ventilation.

In fact, the only concession made in either plan was a provision in the layout of the vent ducts, for their possible connection to the circulating fans which would permit the exhaust air to be returned to the rooms, but it was distinctly stated that this was merely a tentative scheme which did not receive the endorsement of the designing department. In connection with this feature the point was made that the prejudice on the part of the public against recirculation is sufficient in itself to prevent for some time to come the adoption of any such practice. The situation was summed up by one of the speakers who said: "The doctors have yet to prove their case, and it will be time to take up their suggestions when they give us something definite to work on, besides the assurance that the adoption of their recommendations will solve the problems involved."

ONE of those exasperating errors which are so simple in themselves but which are the cause of so much needless trouble, has been discovered in the separate contract law recently passed in Pennsylvania. Probably through a typographical error, a comma was inserted betwen the words "heating" and "ventilating" in the law so that it reads that separate specifications shall be drawn and separate bids secured for the "heating, ventilating, electrical work," etc., of public buildings in that State. As a result, it has been necessary to separate the heating from the ventilating specification, and, morever, to secure separate bids on each part of the work. In the case that has come to our notice, the Gordian knot has been cut by arbitrarily drawing a line through the plans and calling the work on one side of the line the heating work, and that on the other the ventilating work.

THE CONSULTING ENGINEER

"The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

28—Figuring Additional Capacity for Intermittent Heating.

QUESTION: Would you be so kind as to answer the following questions: (1) In a building heated for a short time every week, such as a church, how much should the size of radiators and boiler be increased over the actual requirements? (2) In a fire house, what temperature should the apparatus room be heated to and how much should the radiation be increased for indraft?

ANSWER: (1) The additional capacity to provide for intermittent heating of churches and buildings of this character depends largely on the intervals of time to be allowed for raising the temperature, and the minimum temperature inside to which the building is allowed to drop, with any given outdoor temperature. The shorter the interval, the greater the boiler capacity required. No building should be allowed to become much colder than 40° F. inside and generally; if allowed to cool below this point in extreme weather, it will be impossible to raise the temperature to normal with the ordinary apparatus until the outside weather moderates. There are two methods of increasing the capacity of the heat conveyance of a heating system, both involving an increase in boiler power:

a. By increasing the square feet of radiation operating the job at the same pressure and temperature, and.

b. By raising the steam pressure and temperature on the same total square feet of radiation.

In the latter case care must be exercised that the lowest radiating surface is not too near the water line of the boiler or the difference in pressure, due to rapid condensation, will cause flooding.

There are several formulas available for such estimates, viz., one in Green's "Heating and Ventilation," p. 52, published by the Green Fuel Economizer Co., of Matteawan, N. Y., and several papers and discussions published in THE HEATING AND VENTILATING MAGAZINE. They are all more or less theoretical, as the real time and quantity of heat depends largely on the specific heat and absorbing powers of the wall partitions and furnishings of the buildings. These quantities are somewhat difficult to determine in advance with accuracy.

The following method will give a fair determination of what can be done in any given case and would give fully the same degree of accuracy as the results upon which the design of the job is based from the given conditions. If a room is to be raised in temperature through a given range with a given outside temperature the time will be as follows:

Divide the total rise in required temperature of the room into as many short intervals as desired. The greater the number of divisions the shorter and more accurate the total time. The average difference between the room temperature and given outside temperature during the interval should be deducted from the maximum difference between the outside and room temperature at which the given boiler power will remain constant. Divide this difference into twice the interval of temperature. The result will be the number of hours required to heat the room through the interval.

The reasons for the foregoing are as follows: The heat losses are determined for a minimum given outside temperature at which the room is to be maintained at a given constant inside temperature. These differences determine, with the steam pressure and temperature, the radiation and boiler power. When the room is at the required temperature the radiators transmit the minimum of heat. as any lower room temperature increases the transmission up to the maximum for which the boilers are arranged. Also any lower room temperature or higher outside temperature decreases the losses from the room or building.

This difference, divided by 2, will give the number of degrees range through which the available difference will raise the room temperature in a period of time, say, 1 hr. Each degree the room is raised increases the loss to the outside by a like amount. If the number of degrees the temperature is raised in a period of time is divided into the assumed interval, the result will be the time required. Adding the time for the intervals will give the total time required. When the difference between the room and the outside approaches the final difference for which the boiler and radiators are designed, the time becomes correspondingly greater.

Let us assume an outside temperature of —10° F., a room temperature of 70° F. and

boilers and radiators for 2 lbs. pressure, or 215° temperature, and a transmission of 1.7 B.T.U. per square foot per hour per degree difference of the room and radiator. If the boiler pressure is provided to carry 5 lbs. gauge on the radiation, or is increased at 2 lbs. pressure a corresponding percentage, what will be the time necessary to raise the rooms 40° to 70° F., when it is 20° F. outside?

The maximum difference between the room at 70° and the outside at —10° would be 80°. The percentage of boilers added for the above change in pressure and the percentage of radiation to be added if the pressure is maintained at 2 lbs. gauge as before, would be (temperature at 5 lbs. gauge is 227° F.).

(227—70°) x 1.7 B.T.U.÷ (215—70) x 1.7 B.T.U.=267 B.T.U. per square foot per hour ÷246 B.T.U. per square foot per hour, or 108.6% increase in boiler power or radiation and boiler power combined. The corresponding outside difference in temperature would be 80x108.6%=8688 or 77° when —10° outside. If 10° periods are assumed, from 40° to 50°, the average inside temperature will be 45° and outside 20°, a difference of 25°. Two times the interval equals 20. 20÷(87—25) =0.323 hrs.

From 50° to 60°, the average room temperature would be 55° less 20° outside, or 35°. 20÷(87—35)=0.384 hrs.

From 60° to 70° the average room temperature would be 65° less 20° outside, or 45° difference. 20÷(87—45)=0.476 hrs.

The total period will be 0.323+0.467+0.384= 1.174 hrs., or 1 hr. and 10 min. If the last period were divided into 5° instead of 10° intervals, the result would be less, as follows: For 60° to 65° the average difference would be 42.5° and for 65° to 70°, 47.5°. 10÷(87— 42.5)=0.225 hrs. and 10÷(87—47.5)=0.253 hrs., or a total of 0.478 hrs., as against 0.476 hrs. With cast-iron radiators, this time will be increased somewhat, due to the weight of the iron and specific heat of the metal in the radiators.

From the above discussion it will be readily determined at what outside and inside temperature the capacity of the apparatus will have to be increased to provide for heating up.

(2.) The temperature to which such rooms should be heated is largely a matter of viewpoint, of which there are several, viz., those of the prospective occupants or the party who buys the fuel and pays the cost of installation, or a contractor trying to underbid a competitor by accomplishing the object with less radiation, or an architect trying to bring the building cost within a certain appropriation.

When horse-drawn apparatus is used and the animals are in the same room, 60° to 65° F. is all that should be required, as the pressure tends to raise the room temperature and high temperatures are unhealthful. Where automobile apparatus is used, the human occupant should be considered.

When considering the indraft the radiation should be sufficient to raise the entire contents of the room from minimum outside temperature to the required room temperature in about 15 min. or an equivalent air change of four times per hour in addition to the radiation losses. If the indraft is provided for, there will be little difficulty with the room temperature when the doors are closed.

29.—A Problem in Rapid Water Heating.

QUESTION: Can you answer the following questions for us? How fast can a sheet of water 1 in. thick, be moved over a sheet metal surface, 10x20 ft. in size, with solid crude oil flame underneath, so as to heat the water from 40° F. to 150°F?

Would a coil arrangement as distinguished from a sheet metal arrangement secure better results?

How much crude oil would be burned per hour in keeping a solid flame under said sheet, and how many burners would be required?

ANSWER: This is a question of boiler heating surface and the rate of transferring heat is only limited by the amount of power available and the amount of heating surface provided. Water has the greatest absorbing power for heat of any substance and is at the same time a relatively poor conductor of heat. The rate of transmission through surfaces is proportional to the difference in temperature on either side and the velocity of the fluid over the surface.

The heating surface given is 200 sq. ft. One H. P. hour is equal to 34.5 lbs of water evaporated from and at 212° with a transfer of 970 B.T.U. Then 34.5x970 B.T.U.=33,500 B.T.U. per hour or 1 H. P. Ordinary boilers for power are rated at 10 sq. ft. per horsepower and can be operated 100% over the rating with forced draft and a sacrifice in economy.

Assuming 5 sq. ft. per horsepower, the 200 sq. ft. of surface would give up, at 40 H. P. rating, 40x33,500 B.T.U. per hour=1,340,000 B.T.U. per hour. The B.T.U. required to raise the given amount of water from 40° to 150°, or 110°, would be, with 62.25 lbs. per cubic foot. (10 ft. x 20 ft. x 1 in.)÷12 in. x 62.25x110=113,668 B.T.U. each time the water is displaced.

Already it will be seen that with 100% over normal rating, 200 sq. ft. of prime fire surface requires or transmits 1,340,000 B.T.U. per hour, then 1,340,000÷113,668=11.8 times per hour, or 118 ft. per hour with the width 10 ft. and one-half that with the width 20 ft.

A regular boiler built for the purpose will

be far preferable. The work to be done is the same whether oil, coil or steam is used and there is no limit to the amount or rate of work if boiler horsepower and sufficient heating surface for the temperatures are provided.

Crude oil requires air pressure or steam to properly burn it and furnish the required oxygen which is about 15 lbs. of air per pound of oil, depending on its character. This requires high pressure steam and an air compressor. Upon inquiry the desired quantity of water was given as 100 gals. per minute, or

8⅓x100 gals. x 110 x 60 min. = 5,497,800 B.T.U. per hour.

5,497,800÷33,500=164 H. P

It is evident that 200 sq. ft. of surface would be entirely inadequate, no matter how hot it was, as 164 H.P. would aggregate 1,640 sq. ft. of heating surface. If oil were used at 80% efficiency, worth 20,000 B.T.U. per pound the number of pounds per hour would be

5,497,800÷(20,000x80%)=344 lbs. per hour.

To properly burn oil an arch of fire brick is provided or pile of fire brick in a special furnace which is heated to incandescence by the flame and the heated gas is then passed over the boiler surface which extracts the heat. There are many types and methods and burners applicable to this particular apparatus.

LEGAL DECISIONS

Action for Installing Steam Heating Apparatus—Insufficient Defense.

In an action for the recovery of a balance due for installing heating apparatus, there was no evidence that the plaintiff had damaged a boiler, or that such boiler was in fact damaged. It was therefore held that a certain letter concerning the damage was not admissible in evidence, being merely hearsay, and being the statement of third parties in their own interest. The giving of an instruction to the jury which assumed that delay of the plaintiff in completing the work was caused by the defendant, or those working for him, was held not to be prejudicial error, even if not based on the evidence, since the plaintiff was entitled to recover, while the defendant did not prove any defense either by way of set-off or recoupment, and there was no damages due to delay.—National Steam Heating Co. vs. Moulton, 182 Ill. App. 483.

Electric Heater Patent.

The Morford patent, No. 490,034, for an electric heater, consists, as stated in the patent, in imbedding conductors in an enamel of insulating material that is made to adhere to the device that is to be heated by or otherwise used in connection with an electrical current, and which serves to insulate the conductors while connecting them to the device. It was held that it could not be construed to cover glass as an equivalent, in view of the express disclaimer of such material by an amendment of the application while pending in the Patent Office, to avoid references cited by the examiner. As so constructed it was held not infringed. —Simplex Electric Heating Co. vs. Leonard, C. C. A., 200 Fed. 581.

Patent Case—Relief-Valve for Steam Radiator.

The Brissenden patent, No. 952,414, for an automatic relief-valve for steam radiators in which the proper adjustment of the parts is indicated by the escape of steam when the valve seat is displaced, in view of the prior art cannot, it is held, be given a broad construction, but must be limited to the peculiar arrangement of the parts shown. As so limited it is held not infringed by the device of the Leuthesser patent, No. 944,338, in which a stem indicates displacement, operating mechanically, without the aid of steam pressure.—Monash-Younker Co. vs. National Steam Specialty Co., C. C. A., 208 Fed. 559.

Mechanics' Lien for Material Used in Steam Heating Installation—Delays Caused by Other Contractors.

An owner entered into a contract with the John A. Wickum Company to install a steam heating plant in a building to be erected by such owner. The amount of the contract with extras furnished thereunder was $7,457.80, of which $3,500 was paid, leaving a balance of $3,957.80. The American Radiator Company and the Kellogg-Mackay-Cameron Company were sub-contractors, and under their contracts with the Wickum Company had furnished materials to the said Wickum Company used in the installation of the plant, for which there was due and unpaid the Radiator Company Company $1,754.75 and the Kellogg Company $1,800. To enforce a mechanic's lien for these sums the Radiator Company filed a bill and the Kellogg Company intervened. It was admitted by the owner that the material was finished and used as averred, and that the amounts claimed to be unpaid thereon were correct; also that the necessary steps to establish liens were taken. The owner claimed that on account of delay by the contractor he was entitled to charge a sum for liquidated damages against the balance unpaid on the contract;

that the contract provided that the work would be completed on or before November 10, 1907, and that it was not completed until March 1, 1908. There was evidence, however, that this delay was caused by other contractors; among other things, that the first car of radiators were delivered December 13 or 15, 1907, and that, as it could not be taken into the building, owing to its incompleteness, it was piled up along the walk in front of a neighboring piece of property. Decree for the complainant was sustained.—American Radiator Co. vs. Kesner, 181 Ill. App. 482.

ELBERT HUBBARD ON TRADE PAPERS.

Trade Papers—Their Appeal and Power.
(*This series of articles commenced in the September, 1913, issue.*)

The brain is an organ and its function is to think.

And our sanity is determined by the mental voltage we carry.

So long as we are live wires, so long as we transmit power, radiate love, give out sympathetic warmth, think individually and act collectively, we establish our right to live.

But a lazy man, whether his sluggishness and slothfulness is mental or physical, is as useless as a dead man—and takes up more room.

The world is made up of two classes—the routiners and the pioneers.

The former class are the smug, self-satisfied folks who carry caution to excess. "Form A" and "Schedule B; Class III" is their rubric; and red tape is their phalactery.

They are the cause of inefficient efforts to eliminate inefficiency. That is to say, they are a drag upon the wheels of progress.

To do certain things in a certain way is eminently proper, but we now want quicker methods, more serviceable systems. We want things "right now." And the concern that gives them to us—right off the bake-stone—is the one that gets our business.

We move with the times—or get left!

Shakespeare said something about the seven ages of man. But man has only five stages—the baby-buggy stage, the rig stage, the cycle stage, the auto stage and the hearse, but while he is not responsible for his first stage he can prolong his last one.

Whilst perhaps it is true that the American business man is in too big a hurry to attend to detail, and while it may also be true that we may leave our margins too big and untrimmed, still there is no useful purpose served in a too slavish allegiance to moth-eaten, rust-worn rules and regulations.

When a man satisfies himself that his name-plate—John Jones—Merchant—is all that is necessary to get business ("for everybody knows that the Jones' have been in the business five generations"), he is in the chrysalis state, he is in his cocoon. Also he is in his coffin, for he is a dead one. Routine killed him. He lacked imagination and the blessing of anticipation.

Imagination and anticipation is the double cylinder, expansion engine of humanity.

The pioneer is blessed with a full equipment and his life speaks of prescience, strength of character and courage. His anticipation is a sort of prophetic vision, a kind of instinct.

The power of a seeing mind is tremendous—and it belongs to the man who exercises his gray matter by ceaseless inquiry and search.

The pioneers are the anticipators, the routiners are red-tapers.

Our huge liners as they cross the ocean, ever have a man in the "crows' nest." He's on the lookout. And upon his wideawake, alert sight depends much of the safety of the ship, cargo, and human freight.

To him every object that enters his vision is full of meaning and is duly noted, reported and recorded by the officers.

The simile seems to me to be especially happy as applied to the editorial department of Trade and Class Papers, of which we have such a splendid representation in this country.

Nowhere in journalism is there a finer array of talent than is to be found in the columns of these informative and trade reflecting papers.

There is absent that flippancy and flummery of the cheap newspaper.

Instead the Trade Papers are full of facts that are throbbing with pulsing life and vigor. There are to be read articles that have the saving literary savor, the salt of commonsense, and the tabasco of criticism.

The Trade Paper is the happy medium between the "excruciatingly funny" comic section of our newspapers and those magazines for mummies that are wrapped in a most humorous sadness.

The Trade Paper treats of its subjects in a manner that is exhaustive but not exhausting, comprehensive yet concise.

There is more in the power of timely suggestion than most of us dream of. And the value of these papers to many people is not only in the actual articles written, but because of the cycle of thought it occasions—the mind images it gives—the breadth of life it breathes into the crude creations of their imagination.

The Trade Paper crystallizes thought for us. It presents to us mental pabulum in cubes and tablets.

The Trade Paper caters to the specific needs of its subscribers, and in so doing, entertains and demonstrates the beneficence of co-operation.

Co-operation is the fulcrum of future success—social, commercial, national and international.

The Trade Papers believe in this companionship, this helpfulness and mutuality. And in their well-edited, well-written columns is to be found the incentive to vigorous effort, unselfishness and success.

For the dealer, worker, business man—the Trade Papers are invaluable. They are as full of ideas as an arsenal full of ammunition; as full of food as an egg is full of meat.

And so we look to the Trade Paper with eager confidence, and have the supreme satisfaction of knowing that we shall be able to find there one of our sources of power.

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Standard Sizes of Catalogues.

A committee of the American Society of Mechanical Engineers, which has been investigating the sizes of catalogues with the purpose of compiling its recommendations for standard sizes, reports that there is a universal opinion that catalogue sizes should be standardized.

"The standard of 6 in. by 9 in.," says the committee, "has for so many years met with such wide acceptance, probably two-thirds of all the catalogues that are now made being either that size, trimmed as closely to exact size as possible, or within ¼ in. of it in one or both dimensions, that it may be considered as too well established ever to be abolished.

"The 6 in. by 9. in. size is too small for many purposes, and it is necessary to have for some purposes a size which is about 8 in. by 10½ in. or 8½ in. by 11 in. There are objections to having both considered as standard sizes, and as there is an increasing tendency to the use of the larger size the committee recommends that 8½ in. by 11 in. be the standard. Electrotypes 4 in. by 7 in., which are commonly used for 6 in. by 9 in. pages, may conveniently be used, two on a page, on an 8½ in. by 11 in. page, but they are too large for the 8 in. by 10½ in. page. The 8½ in. by 11 in. page folded twice makes 3⅞ in. by 8½ in., which is a convenient size for a long folder.

"The 9 in. by 12 in. size has been adopted by a few for very large catalogues. While it is generally acceptable for technical and trade journals, it is rather too large for a catalogue, unless it is to be a large cloth-bound book, to be placed on a shelf and not filed in a cabinet. It should, therefore, not be recommended as a standard for common use."

The committee also recommends that for paper-covered catalogues intended to be permanently filed, the edges, including the cover, should be trimmed to exact size. No fancy deckled edge or dark tinted paper should be used. Overlapping edges of the cover are permissible when the catalogue is bound in covers stiff enough to support its weight in boards or heavy card paper. The title should always be printed on the

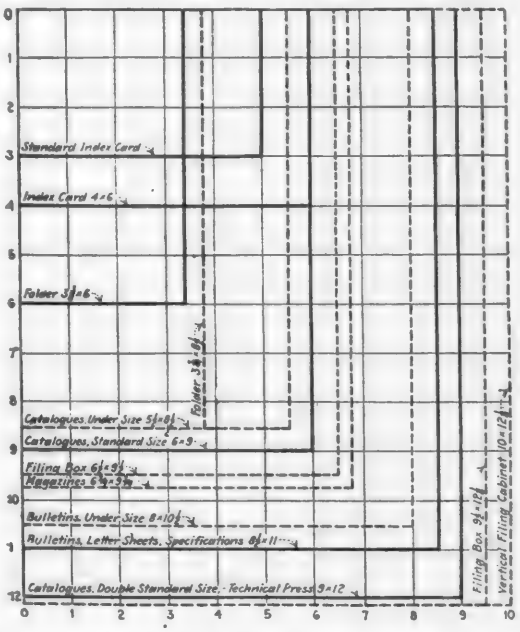

Standard Index Card
Index Card 4×6
Folder 3⅞×6
Folder 3⅞×8
Catalogues Under Size 5×8
Catalogues, Standard Size 6×9
Filing Box 6½×9½
Magazines 6½×9½
Bulletins, Under Size 8×10½
Bulletins, Letter Sheets, Specifications 8½×11
Catalogues, Double Standard Size, Technical Press 9×12
Filing Box 9½×12½
Vertical Filing Cabinet 10×12½
0 1 2 3 4 5 6 7 8 9 10 11 12
0 1 2 3 4 5 6 7 8 9 10

DIAGRAM OF STANDARD SIZES FOR CATALOGUES, ETC.

exposed back of the catalogue whenever possible, for purposes of identification.

Every catalogue, says the committee, should have a date on its title page, and a standard size index card 3 in. by 5 in. should be enclosed, with the title of the book and a brief statement of the character of its contents printed on it.

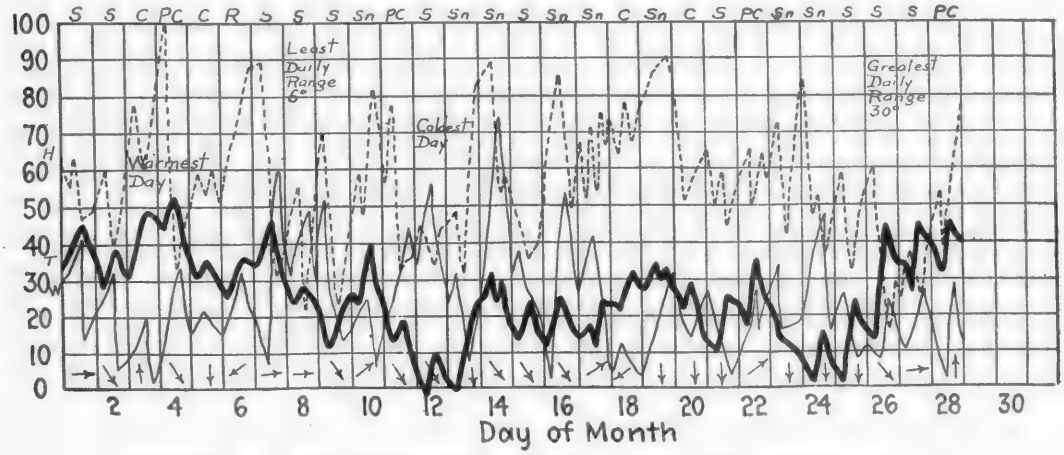
The chairman of the committee which drew up the report is Prof. William Kent.

Detroit Engineering Society.

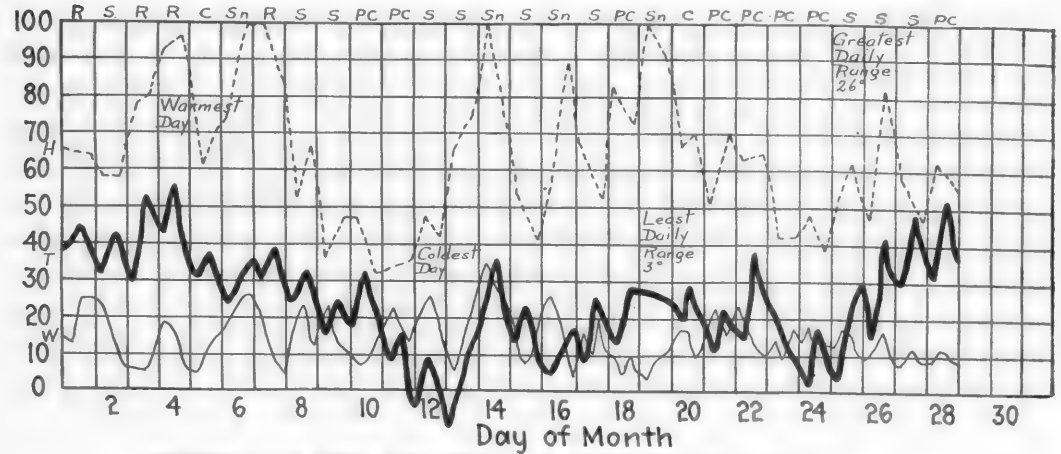
The March meeting of the Detroit Engineering Society, Detroit, Mich., held March 20, was devoted to a symposium on the subject of heating and ventilation. The principal speakers and their subjects were: "Modern Practice in Heating and Ventilating Shops," F. R. Still; "Modern Practice in Heating and Ventilating Public Buildings," J. R. McColl, and "Modern Standards of Ventilation," Ralph Collamore.

The Weather for February, 1914

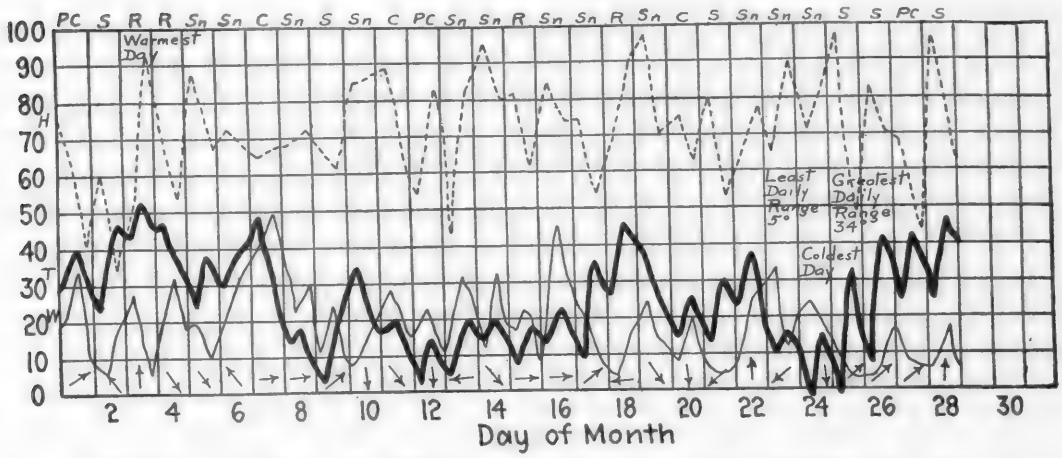
	New York.	Boston.	Pittsburgh.	Chicago.	St. Louis.
Highest temperature, degrees F	52	56	52	48	62
Date of highest temperature	4	4	3	28	17
Lowest temperature, degrees F	–2	–11	–2	–6	1
Date of lowest temperature	12	12	24	8	7
Greatest daily range, degrees F	30	26	34	30	40
Date of greatest daily range	26	25	25	28	17
Least daily range, degrees F	6	3	5	5	3
Date of least daily range	8	19	23	20	23
Mean temperature for month, degrees F	25	24	24	20	27.4
Normal mean temp. for month, degrees F	30.7	28	31.8	25.4	33.5
Total rainfall, inches	3.27	3.07	3.13	0.9	4.63
Total snowfall, inches	17.4	20.6	23.3	7.2	23.5
Normal precipitation, this month, inches	3.74	3.44	2.66	2.16	2.75
Total wind movement, miles	13239	8553	8994	8702	9293
Average hourly wind velocity	19.7	12.7	13.4	13	13.8
Prevailing direction of wind	N.W.	W.	W.	S.W.	N.E.
Number of clear days	10	11	9	7	13
Number of partly cloudy days	8	10	6	8	6
Number of cloudy days	10	7	13	13	9
Number of days on which rain fell	15	8	15	14	10
Number of days on which snow fell	8	4	12	6	5
Snow on ground at end of month, inches	2	5.6	4.8	0.5	Trace



RECORD OF THE WEATHER IN NEW YORK FOR FEBRUARY, 1914.
(Hourly Observations of the Relative Humidity Are Plotted on this Chart.)



RECORD OF THE WEATHER IN BOSTON FOR FEBRUARY, 1914.


PC S R R Sn Sn C Sn S Sn C PC Sn Sn R Sn Sn R Sn C S Sn Sn Sn S S PC S
Warmest Day
Least Daily Range 5°
Greatest Daily Range 34°
Coldest Day
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W
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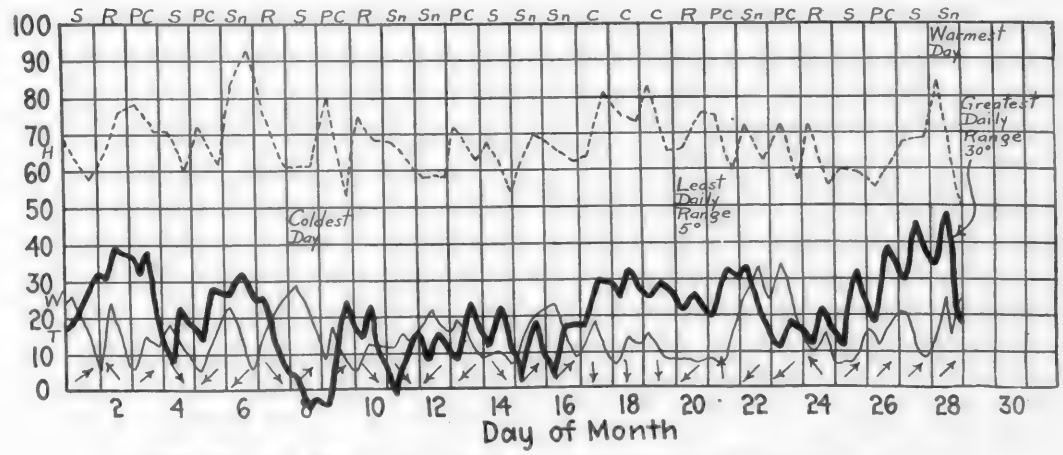
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN PITTSBURGH FOR FEBRUARY, 1914.


S R PC S PC Sn R S PC R Sn Sn PC S Sn Sn C C C R PC Sn PC R S PC S Sn
Warmest Day
Greatest Daily Range 30°
Least Daily Range 5°
Coldest Day
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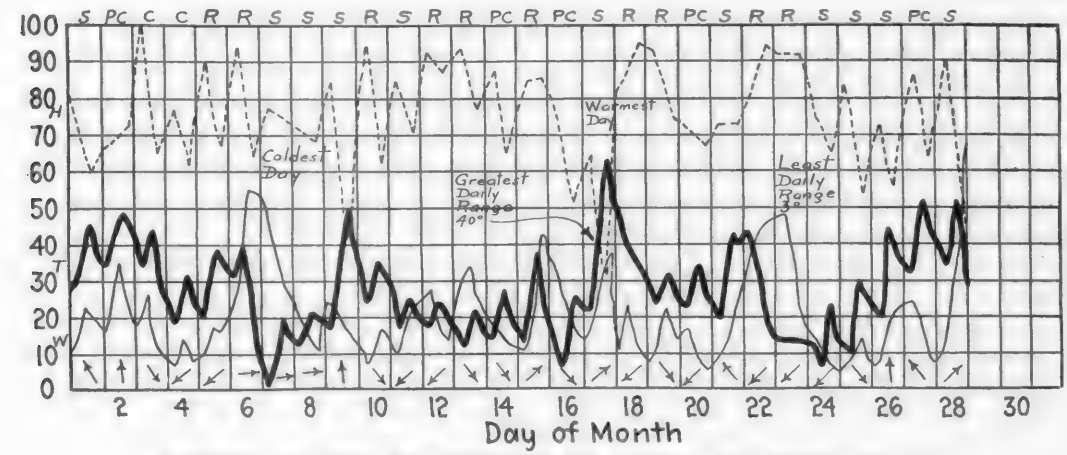
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN CHICAGO FOR FEBRUARY, 1914.


S PC C C R R S S S R S R R PC R PC S R R PC S R R S S S PC S
Warmest Day
Coldest Day
Greatest Daily Range 40°
Least Daily Range 3°
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100 90 80 70 60 50 40 30 20 10 0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN ST. LOUIS FOR FEBRUARY, 1914.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

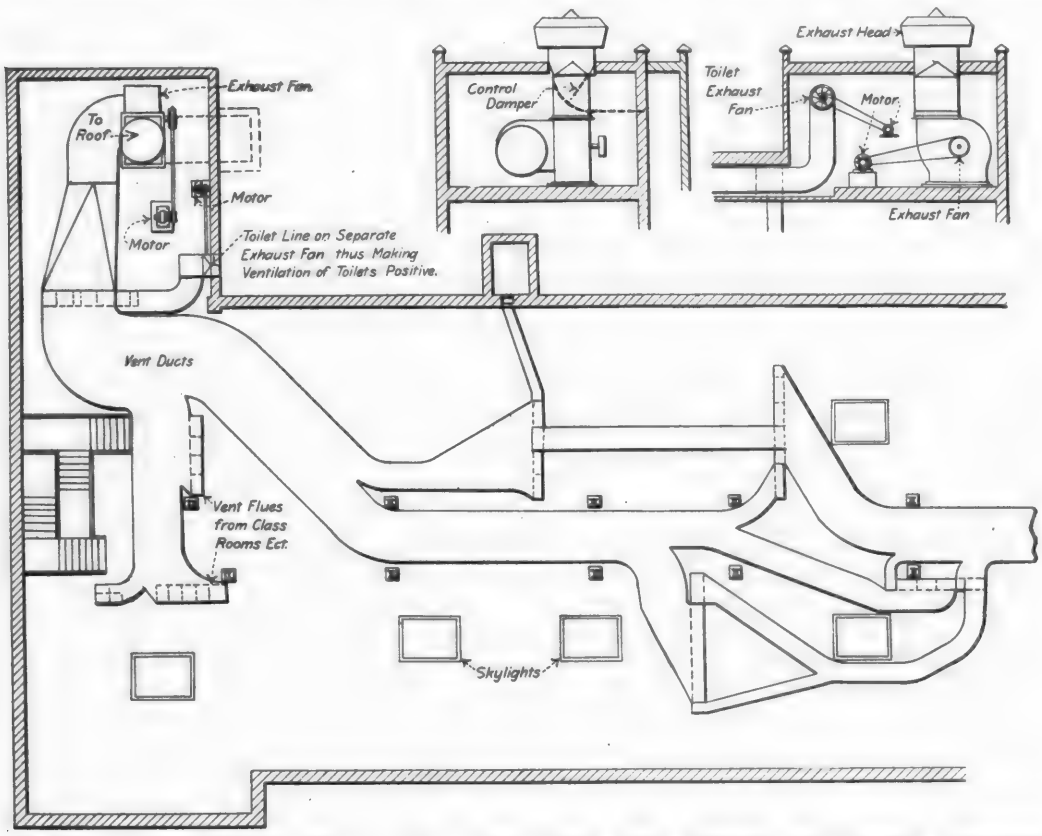
AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New York Chapter on School House Heating and Ventilation.

A display of the latest methods used for the heating and ventilation of school houses, showing two notable variations of practice, was made at the March meeting of the New York Chapter. The principal speakers were Frank G. McCann, chief of the engineering department of the New York City Department of Education, who showed plans of a school building in course of construction which is equipped in accordance with the department's latest standards; Dwight D. Kimball, who exhibited plans of the Watt School, in Pittsburg, which is now being constructed; and George W. Knight, head of the engineering department of the Newark (N. J.) Department of Education.

Probably the most notable point brought out by the speakers was the slight variation in the standard practice of to-day as compared with that of four or five years ago, in spite of the agitation of the doctors and physiologists. In the case of the New York school buildings, the most important innovation is the provision now being made for air washers. In connection with use of exhaust fans in the New York schools, Mr. McCann showed how the system could be arranged so as to recirculate the air if such a course should ever be found desirable.

Mr. McCann began his address by referring to a typical method of class room ventilation in which the air is exhausted through the coat lockers. He stated that he believed in the use of exhaust fans, and said that as many of the new school buildings in New York have gymnasiums on the roof, he had been able to take advantage of this to put in false ceilings for accommodating the exhaust ducts and fans. Vent fans, he said, can also be used successfully in school buildings during the summer time when the boilers are not in service. He said that the present practice in his department was to heat auditoriums by hot blast only, with no direct radiation. Air is introduced at 80° or 90° F. as necessary to care for the heat losses, and is made to flow up in front of the windows. Air outlets in assembly rooms



TYPICAL PART ROOF PLAN FOR NEW YORK CITY SCHOOL BUILDINGS, SHOWING FANS USED TO CREATE POSITIVE OUTFLOW OF VITIATED AIR AND POSSIBLE RECIRCULATION OF VENTILATION AIR, IN CASE SAME LATER BECOMES FEASIBLE.

are through registers in the floor. The department, he said, is now figuring on using hollow pedestals in the chairs to carry away the vitiated air. The foul air is usually carried up to the top of the building through flues located near the chimney. Arrangements are provided to recirculate the room air to keep same warm when unoccupied but automatic air control is provided to prevent recirculating the room air when room is occupied.

Mr. McCann declared that the roof is not a fit place for a fresh air intake, on account of the chimney gases, toilet vent pipes, etc. He said it was his practice to locate the fresh air intake about 25 ft. from the ground and pass the incoming air through an air washer.

The equipment of the playrooms, said Mr. McCann, is now composed of separate units, as the children are generally packed in such rooms immediately before the opening of the school sessions and arrangements must be made for venting the rooms quickly. In summer the vents can be shut off or used to withdraw air while the windows are opened to admit fresh air.

In the ensuing discussion it was brought out that heat regulation is now being extended to the halls and stair wells. The vibration caused by the exhaust fans on the roof is effectually taken care of by cork in the foundations. The danger of infection on account of the air passing through the cloak closets is practically nil, as it is now generally agreed that the dangers of air infection are remote, especially as the large volume of air thus passed over clothes oxidizes the bacteria, etc.

Dwight D. Kimball, the next speaker, resigned the chair while he displayed the heating and ventilating plans for the Watt School, in Pittsburg. Mr. Kimball said that the independent heating engineer is under a handicap in that he has to meet many opinions. In Pittsburg, he said, almost every school is being built by a different architect, with the result that there is a great variety in the kinds of systems installed. He said the use of bituminous coal in Pittsburg had an important bearing on the problem of heating and ventilation and requires the use of air washers and humidity control, as well as fresh air and exhaust fans.

Mr. Kimball called especial attention to the wording of the Pennsylvania law for the separate letting of heating and ventilating contracts, whereby a comma placed between the words "heating" and "ventilation" requires that these contracts must be let separately. As a result, he said, it had been found necessary to divide the system arbitrarily and secure separate bids on each part.

George W. Knight, engineer for the Newark Department of Education, showed the development of the goose neck air outlet, which is a feature of the air supply ducts as designed by his department. He stated that the practice of his office was to bring in the air through the floor through mushroom ventilators and exhaust the vitiated air through the ceiling. An air velocity of 100 ft. per minute was generally maintained through the ventilator. He had also sometimes placed vent fans in the basement. Toilet rooms were always independently ventilated without fans.

Mr. Knight then took up the broader subject of the ethics of the profession, and the efforts that should be made to elevate the standards of mechanical equipment and of the profession itself. He traced the development of modern heating apparatus from the stove to the furnace and thence to the modern steam and hot water system. "It is up to us as engineers," he declared, "to show that a heating system cannot be poured into a building. It requires men of brains and such men must be employed. Such men are not always being employed at the present time and it is our fault."

Mr. Knight cited the case of the physicians and of their code of ethics, which he said, would prevent them from taking a case at a lower figure after they had once declared their terms. "This is not so with engineers," he added, "as most of us will take up a proposition at a reduction rather than lose it. If a large building is in question, said Mr. Knight, the engineer must be consulted. He is the doctor as the contractor is the druggist who fills the prescription. Mr. Knight also called attention to the practice of criticising one another's work, and declared his belief that a greater degree of co-operation was needed among engineers.

In the discussion of Mr. Knight's remarks it was brought out that the education of engineers should be supplemented by the education of school building committees, architects and taxpayers generally.

Under new business, Perry West suggested the appointment of a committee from the chapter to act in conjunction with the New York State Commission on Ventilation. Mr. West declared that the heating engineer is being dragged along instead of leading in the solution of heating and ventilating problems. He said that the engineers should make the necessary investigations, and spoke of the possibility of using the facilities afforded by such insti-

tutions as the Rockefeller Institute and Carnegie Institute. It was voted that the services of such a committee be offered to the New York State Commission, the appointment to be made later.

As usual, the concluding meeting of the chapter, in May, will be devoted to the annual dinner, and the following committee was appointed by President Kimball to make the necessary arrangements: F. K. Davis, chairman; George G. Schmidt, G. W. Knight, W. S. Timmis, W. H. Driscoll and J. I. Lyle. The committee is already at work on its plans and some unique features are promised.

Massachusetts Chapter Discusses Pending Legislation.

The March meeting of the Massachusetts Chapter was devoted largely to a discussion of the bills bearing on the operation of the heating and ventilation laws, which have been presented to the Massachusetts legislature. On the day of the meeting a hearing had been held before the Committee on Public Health on House Bill No. 928, which proposes to place the ventilation of school buildings under the State Board of Health; and on a report of a special committee (No. 2113) of the Massachusetts legislature on tuberculosis. At this hearing a majority report of the Committee on Public Health had recommended the placing of the ventilation of school buildings throughout the commonwealth under the jurisdiction of the Massachusetts Board of Health.

President J. W. H. Myrick, of the Massachusetts Chapter, reported that he had appeared at the hearing in opposition to the bill, together with State Building Inspectors, including General Whitney, chief of the department, and others. Mr. Myrick stated that ventilation in the modern school house naturally has more or less to do with the heating and it would only be possible for a board of health to control the ventilation, without considering the heating. Furthermore, he said, the bill makes no provisions for an appeal from a decision of the health board, regardless of what any decision so made might be as regards knowledge of the subject. The bill further lacked any penalty, making it devoid of force.

Mr. Myrick also stated that the subject had been thoroughly discussed before the American Society of Heating and Ventilating Engineers two years ago, when the society invited leading professional men in this line to appear at its annual meeting.

At that time, said Mr. Myrick, there was practically no uniform opinion. Dr. Gilman Thompson, of Bellevue Hospital, insisted upon open windows, while Dr. Luther H. Gulick, of the Russell Sage Foundation, claimed that no special ventilation was necessary, as the desired results, such as the breaking up of the air envelope about the body, could be secured by the agitation of the air. Prof. Bass, of Minnesota, added Mr. Myrick, claims that 10 cu. ft. of fresh air per person per minute is sufficient where other experts were demanding even 60 cu. ft. The question of upward or downward ventilation, said the speaker, is still a disputed point, as some doctors claim that the proportion of CO_2, or carbon dioxide, is still a proper basis for determining the purity of the air, although most of them agree that the amount of CO_2 is immaterial, except as indicating the general condition of the air.

Mr. Myrick stated that only one speaker appeared at the hearing in favor of the bill, and this speaker claimed that a certain school in Brookline has an excess of dust with a relatively low humidity.

The Massachusetts District Police, Mr. Myrick pointed out, have been for over 20 years the pioneers in the line of school house ventilation and their recommendations have been adopted by many other States. They have a large corps of inspectors working in this department, and, while Mr. Myrick stated he could not agree with all of their recommendations, he could not see the advantage of turning over the department's work to those who do not claim to have a remedy for the so-called existing troubles. Mr. Myrick also reminded his hearers that the State health department was given partial jurisdiction in this matter a few years ago, and, he said, utterly failed to make a proper recommendation or execution at that time.

The chapter went on record as opposed to the pending bill.

Illinois Chapter.

"Hot Water vs. Modulated Steam for House Heating Purposes" was the topic for the March meeting of the Illinois Chapter, which was held March 9 in the club room of the Great Northern Hotel. The subject was debated by two sets of speakers, the hot water advocates being led by E. J. Claffey and W. B. Graves, while the advantages of modulated steam were put forward by Frank J. Douglass, George H. Getschow and Charles F. Newport.

President H. M. Hart, who presided, told of the further experiments he had made, in company with James H. Davis, in the ventilation of theatres in Chicago and in cabinet tests. In one test, made in the Austin Theater, which is equipped with individual mushroom ventilators under the

seats, he stated that as the tests which were for air currents and distribution of air were made when the building was unoccupied, the expedient had been resorted to of placing a lighted candle on each seat. This, it was estimated, would produce practically the same heating effect as the average person.

New members were elected as follows: Clinton E. Beery, Rockford; J. F. Tuttle, W. H. Chenoweth and C. C. Cheyney, of Chicago.

The April meeting will be devoted to a discussion of air washers.

J. J. Blackmore Appointed Secretary.

Announcement is made of the appointment of J. J. Blackmore, of New York, as secretary of the American Society of Heating and Ventilating Engineers. The appointment took effect March 24. Mr. Blackmore succeeds Edwin A. Scott, who was compelled by ill health to resign not only

J. J. BLACKMORE,
Secretary, American Society of Heating and Ventilating Engineers.

the secretaryship of the society but his business connections, as announced last month.

Mr. Blackmore has long been a prominent figure in the heating trade. He was for nearly twenty years manager of the heater department of the J. L. Mott Iron Works, New York, leaving that company in 1910 to become secretary of the newly-organized United States Radiator Corporation. He is a charter member of the heating engineers' society and is the author of a number of papers and committee reports presented to the society.

Annual Meeting of Institution of Heating and Ventilating Engineers.

At the annual meeting of the (British) Institution of Heating and Ventilating Engineers, held in London, February 3, Kenneth Gray of London was elected president for the ensuing year, the retiring president being J. E. Hartley, of London. The new council members are A. H. Barker, J. Duncan Boyd, George Crispin, A. T. Jenkins, Walter Jones, L. F. Pearson, A. B. Potterton, J. Row, O. Stott and J. Watson.

The council will continue to award prizes to the value of three pounds ten shillings to students passing the examinations in heating and ventilating engineering under the control of the City and Guilds of London Institute.

A. H. Barker presented an exhaustive paper on "Investigation of the Physical Conditions of Room Air." In this paper, which is given in abstract on another page of this issue, Mr. Barker detailed the elaborate experiments he has been making at the University College, together with a description of the experimental apparatus he is using, much of which was especially designed by him.

The summer meeting of the institution will be held in London, June 23 and 24. The date for the autumn meeting was fixed for October 15. The next annual general meeting will be held February 9, 1915.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Pennsylvania State Association.

The annual meeting of the Master Steam and Hot Water Fitters' Association of Pennsylvania will be held in Wilkes-Barre, Pa., Tuesday, May 12, 1914.

Indiana State Association Organizes.

A State association of master steam and hot water fitters was organized during the recent convention of the master plumbers at Lafayette, March 11. Officers were elected as follows: President, Charles Pyke, Lafayette; vice-president, J. A. Gallivan, Muncie; secretary-treasurer, S. F. Martin, Lafayette. Five directors were to be appointed by the president, and a committee was named to draw up a constitution and by-laws. The association will hold its first convention during the master plumbers' meeting at La Porte next year.

Kansas State Association.

The Kansas Master Steam and Hot Water Fitters' Association was organized at Topeka recently with the following of-

ficers: President, Webb W. Tholen, Leavenworth; vice-president, George W. Southern, Topeka; secretary, Carl Graeber, Lawrence; treasurer, Fred H. Bowers, Emporia. Directors: above-named officers and A. P. Elder, Ottawa.

Cleveland (O.) Association.

The Master Steam and Hot Water Fitters' Association of Cleveland is the title of a new organization formed March 2, with 25 members, including most of the contracting firms in this line in Cleveland. The new association will hold its meetings in the offices of the Industrial Association of Cleveland, 608 Arcade.

Annual Meeting of Detroit (Mich.) Association.

At the annual meeting of the Detroit Association of Master Steam and Hot Water Fitters, the following officers were elected: President, J. W. Partlan (re-elected); vice-president, C. P. Tietze; recording secretary, William Gourlay, Jr.; treasurer, John O'Connor.

Emblem of the Fresh Air for All Association.

The accompanying illustration shows the emblem of the Fresh Air for All Association which has already inaugurated a campaign in Chicago for the better ventilation of theatres and street cars. Members of the association wear buttons bearing the emblem in red. The incorporation papers

EMBLEM OF THE FRESH-AIR-FOR-ALL ASSOCIATION.

of the association state that the object is "to educate and promulgate knowledge as to the value and benefit of fresh air for all and the deadly effects of contagious and injurious air; also to secure by organized effort and legislation a change of present conditions for the maintenance of public health and the preservation of human life:"

New $500,000 Building for Bureau of Mines

Plans for the proposed $500,000 experiment station of the United States Bureau of Mines, to be located in Pittsburg, Pa., have been approved by the commission appointed by Congress for that purpose. The Federal government now owns the property upon which will be erected a group of buildings, especially designed and adapted for the carrying on of the mine safety work and other investigations in which the Bureau of Mines is interested. The group of buildings will form a part of a remarkable and unusual setting of monumental edifices devoted to educational purposes. Contracts are expected to be let by July 1, 1914.

Progress of Separate Contract Movement.

Encouraged by the action of the American Institute of Architects in passing a resolution at its recent annual meeting favoring the separate letting of contracts for heating, ventilating, plumbing and electrical equipment, the conference committee of the National Association of Master Plumbers and the National Association of Master Steam and Hot Water Fitters has recently renewed its efforts on a broad scale to secure a nation-wide adoption of the separate contract plan. The conference committee, under the chairmanship of John Trainor, chairman, has recently sent out a letter to every member of both associations quoting the resolution as adopted by the American Institute of Architects and asking that each local association call a special meeting and consider the advisability of sending to every architect and engineer having an office in its territory a letter asking for their co-operation.

The architects' resolution which was adopted in New Orleans, December 2, 1913, reads:

"Resolved, That the American Institute of Architects, in convention assembled, recommends to the members of our profession the adoption of the practice of direct letting of contracts for mechanical equipment, such as heating apparatus and plumbing and electrical equipment. This recommendation is based on the conviction that direct letting of contracts as compared with sub-letting through general contractors affords the architect more certain selection of competent contractors and more efficient control of execution of work and thereby insures a higher standard of work; and, at the same time, serves more equitably the financial interests of both owner and contractor."

FAVORABLE ACTION IN ILLINOIS.

Meanwhile, as already reported in these columns, Illinois has practically come into line for the separate letting of heating and plumbing contracts on State work. This was effected largely through the efforts of a committee representing the Illinois Master Plumbers' Association, being a "Committee for Securing the Separate Letting of

Plumbing and Heating Contracts by the State of Illinois," of which Bernard Gause, of Jacksonville, was chairman. This committee submitted the following propositions to Governor Dunne of Illinois:

"First: The custom of separate letting of plumbing and heating contracts prevails on practically all work that is contracted throughout the State except that which is now contracted by the State government.

"Second: It will be economy for the State to make the contracts separately for the reason that 'general contractors' usually add 10% to our bids when included in a general contract.

"Third: This class of work, by reason of its nature, does not become on any building an essential part of the 'structural work,' hence its elimination from a general contract will make no complication or cause any inconvenience to a 'general contractor' in the management of his work.

"Fourth: On account of the varying conditions in the different parts of the State and the prior equipment of these different institutions with a distinct and different system of installation it makes the direct control by the Board of Administration desirable.

"Fifth: It will enable the 'Board of Administration' to select competent men to install this very important work for your institutions.

"Sixth: Recent changes in the 'lien laws' do not give a sub-contractor adequate protection.

"Seventh: A 'surety bond' that is required of a 'general contractor' fails in the majority of cases to protect the sub-contractor. tractor.

"Eighth: The men engaged in our line of business are for the most part not technically trained business men and they require the protection we are asking.

"Ninth: This class of work is the last which is placed in a building, and where a financial loss occurs we pretty generally suffer the most among sub-contractors, and we have no protection from the 'lien law.'

"Tenth: For the State to persist in including the plumbing and heating with the 'general contract' will, we fear, again bring about a business condition that we labored for twenty years to overcome, at much expense of both time and money; and the very important part that our work has to do with public health we believe requires that stability and permanency be the foundation of the future service that our 'craft' will render to the public, and we are not to make progress if, generally speaking, the business is a financial failure."

The committee also called the governor's attention to the fact that it only requires that the governor instruct the Sate architect and the Board of Administration to let these contracts separately to make the reform effective.

The committee recommended to the governor the appointment of Thomas O'Connor as a member of the Board of Administration, and this appointment was made. Mr. Gause reported that through this appointment he felt that it will be "easy to secure a State-wide adoption of the separate contract policy by everyone that has to do with our line of work."

SITUATION IN MASSACHUSETTS.

A bill is pending in the Massachusetts legislature for the separation of contracts relating to plumbing, heating and electrical work. At a recent hearing on the bill, held before the legislative committee on legal affairs, the speakers included James S. Cassedy, chairman of the legislative committee of the State Association of Master Plumbers, Albert B. Franklin, who spoke for the master fitters, and Alfred J. Hixon, who presented the side of the electrical contractors. There were no speakers in opposition to the measure, although it is stated that the corporation counsel of the city of Boston is opposed to the bill.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL PLANTS—

Central Station Heating. Jay Grant De Remer. This first of a series of four papers discusses the heat, light and power requirements in congested city districts. 3500 w. Engineering Magazine—Feb., 1914. 40c.

FUEL TESTS—

House Heating Fuel Tests. W. H. Meeker and H. W. Wagner. Explains the object of the tests, presenting results, and costs. 85 pp. Iowa State College Bul. 33—Aug. 15, 1913. 60c.

HEATING SYSTEMS—

Elements of Heating. E. N. Irwin. Considers air, steam and water as mediums for the distribution of heat, figuring heat losses, and the radiating surface required. 2500 w. Power—Jan. 20, 1914. 20c.

HEAT TRANSMISSION—

Rates of Heat Transmission. Considers results of experiments on rates of heat transfer which have recently been carried out at the Louisiana State University by E. W. Kerr and A. J. Isacks. 1600 w. Engng—Dec. 19, 1913. 40c.

TEMPERATURE REGULATION—

Heating and Ventilating Large Buildings. C. L. Hubbard. Illustrated description of

devices for automatic regulation of temperature. 1500 w. Prac. Eng., Chicago—Jan. 15, 1914. 20c.

Compromise Movement for the Standardization of Flanged Fittings.

A proposed new schedule of standard weight and extra heavy flanged fittings and flanges, which is expected to meet with the favor and acceptance of all the interests concerned, is being drawn up by a committee representing the American Society of Mechanical Engineers, the National Association of Master Steam and Hot Water Fitters, and the Committee of Manufacturers on Standardization of Fittings and valves.

This step was decided on at a meeting in Washington, March 7, which was attended by representatives of the above-mentioned associations and by representatives of the American Society of Heating and Ventilating Engineers, American Water Works Association, New England Water Works Association, Associated Factory Mutual Fire Insurance Companies, Underwriters' Laboratories, Inc., and representatives of certain departments of the government.

The conference, which lasted all day, was presided over by Dr. S. W. Stratton, director of the government Bureau of Standards and was marked by an effort on the part of all concerned to harmonize the conflicting opinions and interests which have so long delayed the universal acceptance of a single standard schedule. It was found possible to adjust nearly all of the present differences in the published schedules by unanimous consent. On the most important and radical differences between the two principal schedules, the elimniation of the short body fitting, a vote by organizations showed five in favor of such elimination, one opposed and one neutral.

It was arranged that the committees arranged for at the meeting shall place into concrete form within 60 days the desicions of the conference in the production of a schedule which shall be satisfactory to all.

Movement to Limit Heights of Buildings in New York.

Recommendations that the heights of buildings in New York City be limited largely on account of their tendency to shut off air and light, are contained in the report of the Heights of Buildings Commission of New York, which has recently been published. On this point the report says that there are many cases where high buildings have destroyed rentable values of neighboring buildings, and in turn, perhaps, have had their own rentable values destroyed by other buildings. There are limited areas that seem in process of being smothered by their own growth; light and air are being largely shut off, and the streets are becoming entirely inadequate. The commission expresses its belief that the State has adequate power to adopt reasonable regulations in this respect, adding: "Under the police power the State may adopt any reasonable and appropriate regulation for the promotion of the public health, safety and general welfare. . . . New York City has for years restricted the height, size and arrangement of tenement and apartment houses. We merely propose, for the most part, a more general application and extension of methods of control already in use in the building regulations of this city." The commission also calls attention to the fact that few skyscrapers pay large net returns, and argues from this that a building of excessive height is not necessary in order to realize the maximum net return from the land.

Where buildings are crowded in in the manner stated, the report says that "lack of sunlight and the continous use of artificial light undoubtedly have a direct relation to health, eye strain and general physical and mental efficiency. Equally injurious is the lack of adequate ventilation, due to the opening of work rooms on deep and narrow courts within which any circulation or renewal of air is difficult."

In connection with its investigations, the commission held a city planning exhibition in the New York Public Library last November and December, and it is proposed to arrange for a permanent exhibit which will be sent around the country.

Improving the Air Conditions in a Cigar Factory.

Given a building which has been used continuously for the past 25 years for tobacco curing, during which time the walls and surroundings have become thoroughly saturated with the odor of tobacco, the problem is to install a ventilating system that will supply the desired quantity of pure air and eliminate the presence of odors. This problem was placed before the Hackney Ventilating Co., Minneapolis, Minn., manufacturers of the Hackney system of ventilation, and the accompanying plan shows the solution of it. The outstanding feature of this system is that it is so designed and installed as to supply the air required and to exhaust practically the same quantity of foul air. An equally important feature is that the air as brought in is at the outdoor temperature.

In a recent test of the system as installed

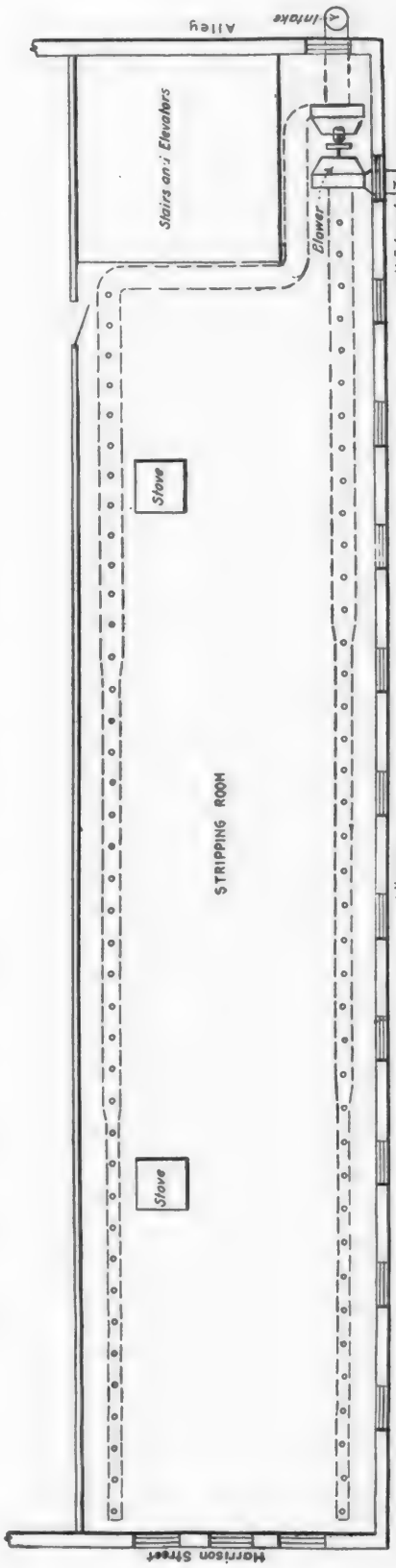
in the factory of P. N. Jacobsen at Davenport, Iowa, which was made by Dr. Radenhausen, he states that the purity of the air is uniformly maintained during the operation of the system, while the odors are practically nil.

This test showed that the condition of the air before the ventilating system was installed was as follows: Carbon dioxide, 0.0025; ammonia, 0.0006; dust and organic matter, 0.005 per cubic foot. After the ventilation system had been in operation five days, a test showed: Carbon dioxide, 0.006; ammonia, 0.00005; dust and organic matter, 0.001 per cubic foot. Reduced to percentages this shows that the ventilation removed 76 per cent of the carbon dioxide, 83 per cent of the ammonia, and 80 per cent of the dust and organic matter. Dr. Radenhausen also states that the ventilation system refreshed the air remarkably without exposing the occupants of the room to drafts.

The installation consists of a No. 45 double centrifugal disc blower, of the Hackney type, consisting of two blowers. The fan wheels are suspended on both ends of a single shaft and are guaranteed to deliver 271,576 cu. ft. of air per hour when operated at the normal speed of 518 R.P.M. The fans are belt-driven by a 3-H.P., 2-phase, 60-cycle, 220-volt motor, with a maximum speed of 1,800 R.P.M., with a controller capable of giving a 50% reduction in R.P.M.

The fans are suspended in this case in an inverted position from the ceiling, and the motor is placed on the floor directly below. The fresh air intake is at the window at the end of the building, connecting with one of the blowers and discharging the air down one side of the room back of the stoves. The foul air duct is run on the side of the room adjacent to the windows.

The air is distributed through forty 3-in. round fresh air deflectors and diffusers and forty foul-air deflectors 3-in. round, with detachable diffusers on the fresh air deflectors, which can be removed during the hot weather, allowing the air to be fanned down on the employees, if so desired. All of the deflectors and diffusers are made of spun brass.



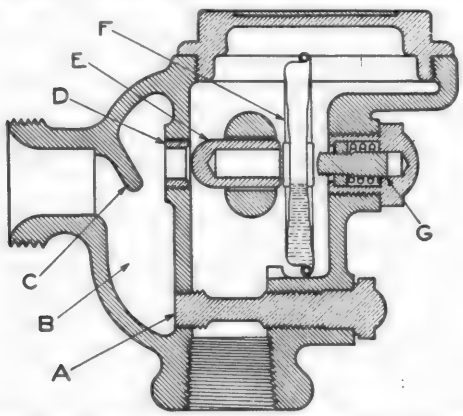
THIRD FLOOR PLAN, P. N. JACOBSEN TOBACCO FACTORY, DAVENPORT, IA., SHOWING INSTALLATION OF HACKNEY VENTILATING SYSTEM.

MECHANICAL REFRIGERATION, seventh edition, by John W. Johnson, has made its appearance. The book has been revised and enlarged, the new matter including chapters on vacuum cleaning and mechanical refrigeration. The book sells at $1.00 and may be obtained through the book department of THE HEATING AND VENTILATING MAGAZINE.

NEW DEVICES

A New Thermostatic Vacuum Valve.

As is well known, the principal enemy of valves in general is the amount of dirt and sediment in the system which must be taken care of. While this is the principal cause of trouble, another cause may be the collapse or rupture of the thermostatic diaphragm. The construction of the new Monash thermostatic vacuum valve for use in connection with the Monash noiseless system of vacuum heating has been designed with especial reference to these points and contains the interesting features of a detached diaphragm and a dirt pocket. Another feature, which is said to be an exclusive one, is that when steam comes to the valve chamber the valve closes instant-



MONASH THERMOSTATIC VACUUM VALVE.

A—Clean out.
B—Dirt pocket.
C—Deflector.
D—Valve seat.
E—Valve.
F—Diaphragm.
G—Spring bumper.

ly without any steam pressure coming in contact with the thermostatic member. The diaphragm, being entirely relieved of all pressure caused by steam remaining in the valve case, cannot rupture itself. There is nothing attached, and no adjustment to make.

The ample dirt pocket in advance of the valve seat is designed so that no dirt or sediment of any kind can pass through the valve opening into the expansion chamber. This pocket is equipped with a deflector to throw the dirt and sediment to the bottom of the pocket, whence it can be removed from time to time as may be necessary by the cleanout.

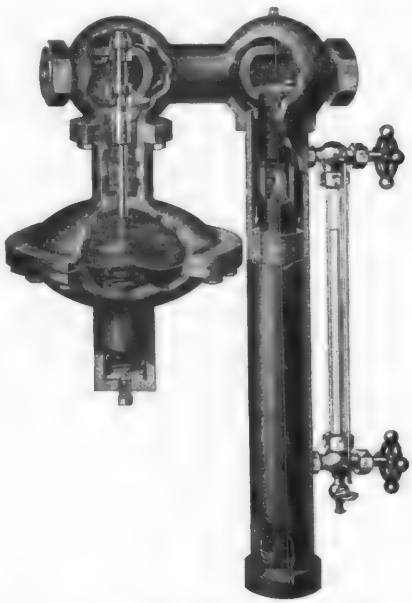
A pocket is provided in the expansion chamber to receive the diaphragm, which is dropped in, no adjustment being required. Provision has been made for the use of a spring bumper to take care of the over-expansion of the diaphragm and to prevent its collapse. This is said to be an entirely new feature in thermostatic valves and does away with the removal of the diaphragm. On this one feature the manufacturers state that they are able to issue a flat guarantee. Additional details regarding this device are to be had from the Monash Engineering Co., 1407 West Jackson Boulevard, Chicago.

A Balanced Column Steam Trap.

A steam trap built on the principle of a balanced column is a notable specialty recently placed on the market by J. C. Hornung, 111 West Monroe Street, Chicago, which is designed to work on any pressure from 0 to 200 pounds. The trap is made without levers or floats, and all moving parts are in a straight line. The manufacturer also emphasizes the feature that there is no wire drawing, hence no valve cutting. In operation it is stated that 1 in. of steam in the water column will equal 1½ lbs. pull on the valve stem. The diaphragm is always 6 in. under water.

Another point emphasized is that when used, for instance, on central station heating plants, the trap gives the desired positive continuous flow under all pressure and temperature conditions, making condensation meters operate more easily. The balanced column does not permit sudden rushes.

The trap is placed directly in the run, no offset being necessary. A pocket wrench



SECTIONAL VIEW OF THE BALANCED COLUMN STEAM TRAP.

and three minutes' work suffices for cleaning it. The trap is furnished in four sizes, with inlet and outlet openings running from ¾ in. to 2 in.

New Form of Safety Hollow Set Screws.

Something new in the way of a set screw has recently been brought out by the Bristol Co., Waterbury, Conn., which is known as the "Bristo" patented safety set screw. The patents were issued October 14, 1913. This set screw, it is stated, is the only one of its kind which does not require a special wrench, as it may be tightly set with an ordinary screw driver or any piece of flat metal about the width of the slot in the screw, using a common wrench for leverage. It is also claimed to be the only one which does not have a natural tendency to expand when pressure is applied to the wrench.

From this it will be seen that these screws are well adapted for use where often taken out and in or where set up and loosened repeatedly, as, for instance, in lathe dogs which are adjusted frequently.

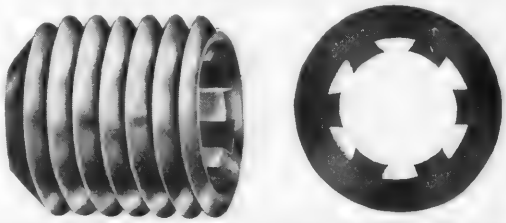
By referring to the accompanying illus-

"BRISTO" PATENTED SAFETY SET SCREW, WITH WRENCHES.

trations it will be seen that the screws, as well as the wrench furnished, have a dovetailed form of slots which, when power is applied, gives a tendency for the wrench and screw to cling together. As there are six slots in each screw, their use is especially convenient in places where but a short movement of the wrench is to be had. The wrench is slotted in both ends so that screws may be used in deep holes.

The screws as made are adaptable for pulleys and collars to replace old-style slotted screws which could not be properly tightened on account of the driver slipping out of the slot. Those interested may obtain a sample screw and wrench free upon request.

At the First International Exposition of

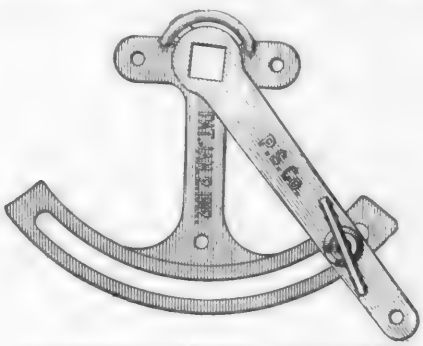


ARRANGEMENT OF DOVE-TAILED SLOTS IN "BRISTO" SAFETY SET SCREWS.

Safety and Sanitation, which was recently held in New York, a silver medal was awarded to The Bristol Company in connection with its exhibit of safety set-screws.

Parker's Damper Quadrant.

An interesting appliance, described as the most perfect and practical device ever designed for controlling dampers and deflectors, is shown in the accompanying illustration. This device is manufactured by the Parker Supply Co., 515 West 45th Street, New York, and the manufacturers call special attention to its labor-saving features. The lever, for instance, locks directly on the frame, doing away with the necessity of drilling and the use of pins, springs and nuts. It is made of malleable iron and can be fitted to either round or square duets. It is said to be the only quadrant that can be used with either rods or bearings. It is made for square rods of ⅜ in., ½ in., ¾ in. and ⅞

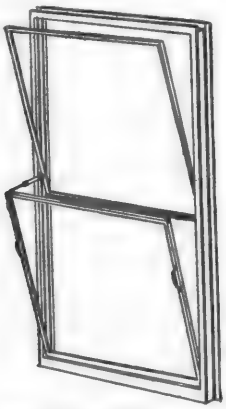


PARKER'S DAMPER QUADRANT.

in. sizes. The two latter sizes are for use on heavy smoke pipes, blower connections, etc. The company issues circular matter, giving additional details of this damper quadrant.

Leonard Ideal Ventilating Window.

A new type of window sash so constructed that the outside air may enter at the meeting rails and at the top of the upper sash has recently been placed on the market by the Leonard Sheet Metal Works, Inc., Hoboken, N. J. It is known as the Leonard Ideal ventilating window. The accompanying illustration shows both sashes open, thus obtaining ventilation in the manner stated. The sashes can be reversed so that the exterior side will be turned towards the interior. In the arrangement as shown in the illustration the sashes are hung on chains with a pivot block placed at the extreme bottom of each sash, hung on overhead pulleys, so that each sash counterbalances the other. No weights are required, and the sashes can be pivoted at any desired point in the frame. Still another feature of this construction is that the top sash can be left open at the top for ventilation and still be locked at the meeting rail. When both sashes are locked, the window corresponds in tightness to the ordinary window sash and, it is stated, requires no weather stripping. The manufacturer states that it has been passed by the National Board of Fire Underwriters.



LEONARD IDEAL VENTILATING WINDOW.

New Publications.

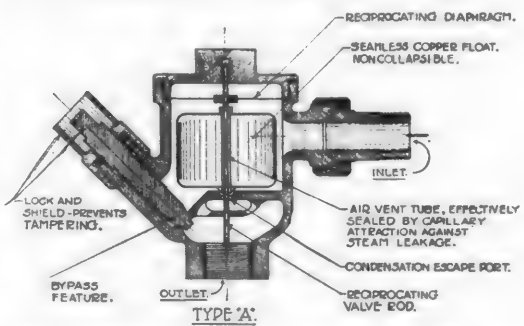
ELECTRIC LIGHT AND MOTOR WIRING, 1914 edition, by George J. Kirchgasser, is the title of a convenient book of vest pocket size, which tells in a way easily understood just what the systems of electric wiring are, including open wiring, molding wiring, conduit systems, concealed knob and tube, etc. The book is published by the Electroforce Publishing Co., Stroh Building, Milwaukee, Wis., bound in limp leather, price $1.00.

V-V IDEA is the title of a new house organ, issued by Vapor-Vacuum Heating Co., Philadelphia, Pa., makers of the Kriebel system of vapor-vacuum heating. Vol. 1, No. 1 is dated March, 1914. The initial issue contains an explanation, with illustrations, of how the Kriebel system works. Another item describes the new home of the company at 1215 Walnut Street, where it occupies the second and third floors. The new location is near the center of the city.

Trade Literature.

LISK'S UNIVERSAL SADDLES, for supporting tanks, boilers and feed water heaters or any other cylindrical construction from 18 in, to 18 ft. diameter, are the subject of newly issued circular matter, published by the manufacturer, J. P. Lisk, 151 Quincy Street, Brooklyn, N. Y. They are designed to make the setting of tanks and other cylindrical constructions a much easier matter than has heretofore been possible. The saddles permit pipes to be run in a longitudinal direction from the bottom of a tank, without going below the floor line or piercing the foundation. The saddles are made in two types, one to be used with pipe stands, and the other for use on piers, floors or beam foundations.

KEYSTONE AUTOMATIC WATER AND AIR RELIEF VALVE, made by the T. T. Burchfield Co., 149 Broadway, New York, is described in new circular matter showing the interior construction of this valve. It is especially designed for use as a return trap for radiators, coils, driers, etc., in connection with vacuum heating systems, or where steam is circulated by means of vacuum return lines. It is automatical in action, permitting the removal of air and condensation from the system without waste of steam. It is provided with a by-pass, controlled by means of a key, which has been found to be an important adjunct in the event of temporary stoppage of the automatic ports. The manufacturers report that the valve is al-

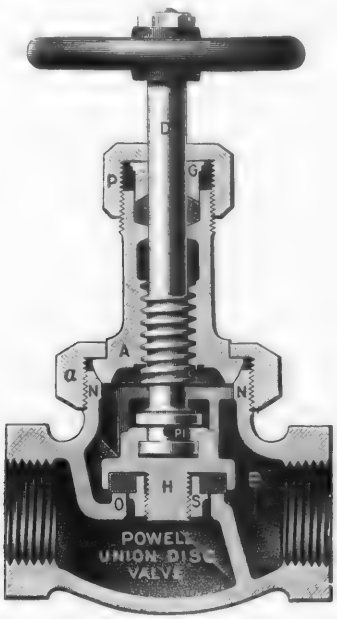


KEYSTONE AUTOMATIC WATER AND AIR RELIEF VALVE.

ready in use on over 2,000,000 sq. ft. of radiation.

POSITIVE CIRCULATION AND UNIFORM DISTRIBUTION OF FRESH AIR is a new booklet devoted to the Knowles' "Notch" air controlling cap and diffuser, heretofore known as the Knowles improved mushroom ventilator. This device is used in connection with the indirect or mechanical system of heating and ventilating auditoriums of theatres, schools, churches, public buildings, etc. It is stated to be equally effective with either the up-draft or down-draft methods. It is also described as ideal for moving picture theatres. The appliances are made by the Knowles Mushroom Ventilator Co., successor to George E. Knowles. The company has recently taken new quarters at 9 Church St., New York.

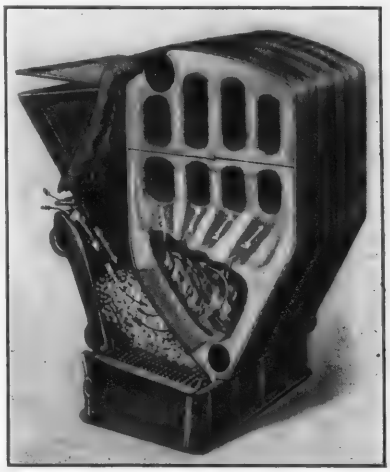
POWELL UNION COMPOSITE DISC VALVES, which are the subject of newly-issued circular matter published by the Wm. Powell Co., Cincinnati, O., are shown in sectional form in the accompanying illustration. These valves are furnished in sizes from 1 in. to 3 in. (bronze), and from 2 in. to 8 in. (iron body). They are intended for medium steam pressure, hot water or steam



POWELL "UNION" COMPOSITE DISC VALVE.

heating work. Special attention is called to the patented connection between bonnet and body neck, which is beveled ground face connection secured by a hexagonal union nut, insuring a steam-tight joint under all pressures. The hexagonal union nut can be unscrewed indefinitely without rounding the corners caused by the wrench slipping, the Acme threads on the stem consisting of six threads. These are all in use when the valve is closed and are designed to prevent stripping from too strenuous use. The valves are guaranteed to stand a steam pressure up to 150 lbs.

SURRELL BOILER, for steam and hot water heating, is described in a new catalogue issued by the Surrell Down Draft Boiler Co., 39 Cortlandt St., New York. The heater is described as a cast-iron sectional push nipple down-draft internal combustion chamber steam and hot water boiler. The accompanying illustration shows one of the company's smaller size boilers. It will be



SMALL TYPE OF SURRELL BOILER FOR HOUSE HEATING OR HOT WATER SUPPLY. (Patented).

noted that it is composed of a central combustion chamber with water tubes on the inside of the fire box and an outside water jacket. The space between the combustion chamber and the outside water jacket is the coal receptacle. Attention is called to the vertical construction of the tubes, insuring water circulation and preventing their burning out. The company guarantees, among other things, that under ordinary house heating conditions, when fired once in 10 hours, these boilers will carry the amount of direct radiating surface stated in the price list. They are made in three series each for water and steam, and include 26 in., 31 in. and 47 in. series. Size 5½ by 8½ in. Pp. 8.

TYLER UNDERGROUND HEATING SYSTEM, showing the various Tyler specialties for use on all ditch and tunnel piping for every purpose; also the Tyler boiler feed water weighing machines, meters and traps, are the subject of a chart being sent out by the Tyler Underground Heating System, Pittsburg, Pa. A circular letter accompanying

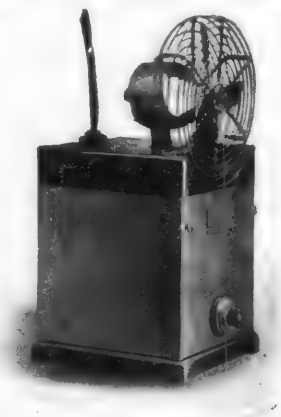
the chart explains the advantages of the various appliances.

VACUUM SEPARATORS for handling pulverized material of all descriptions are described in Bulletin No. 1, received from the Osborne Patented Machinery Co., Inc., 120 Liberty St., New York. Size 6½ by 9½ in. Pp. 20. The company also publishes another booklet (Bulletin No. 2) devoted to its line of smoke-consuming apparatus. Size 6½ by 9½ in. Pp. 8.

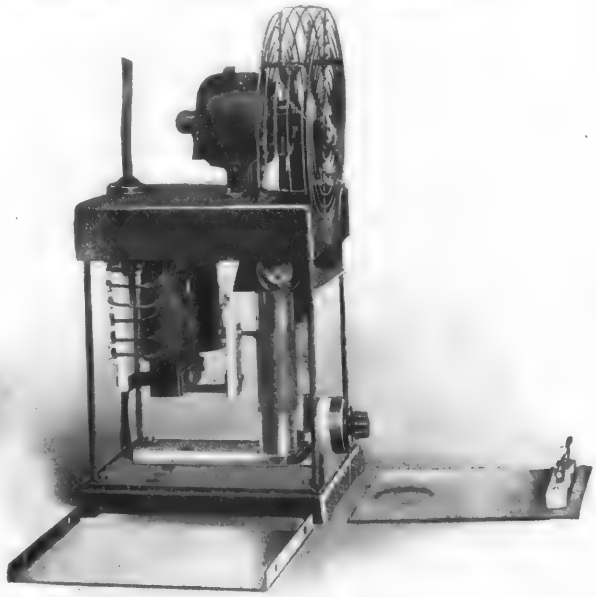
NEW CATHEDRAL BOILERS, installed in the new St. Louis Cathedral, St. Louis, Mo., by Joseph F. Wangler Boiler & Sheet Iron Works Co., St. Louis, are the subject of a circular printed in colors, describing in detail the Wangler boilers used in this structure.

SPRAGUE ELECTRIC FANS, made by the Sprague Electric Works of General Electric Co., New York, is the title of the 1914 catalogue of this company's product (Catalogue 329), covering its assortment of direct and alternating current desk, ceiling, column and exhaust fans. Size 8 by 10½ in. Pp. 36.

PORTABLE OZONATORS, made by the Sprague Electric Works of General Electric Co., New York, are presented in a new bulletin (No. 49,000) illustrating the various types of these machines and describing their uses and operation. They are built in two sizes, known as the Household and Universal. Both sizes are practically identical with the exception of their ozone capacity, the Household size being supplied with two ozone producing units and the Universal with eight. They are furnished for operation with either alternating or direct current. The manufacturers state that they have been approved by the National Board of Fire Underwriters. These ozonators are constructed wholly of non-combustible material, such as steel, porcelain and glass, no inflammable substances other than the insulation on the wires being employed. Each of the ozone producing units consists essentially of two concentric tubes, an inner steel tube surrounded by a metal-coated glass tube of somewhat larger diameter so as to allow an air space between the two tubes. When a high voltage current from the transformer flows between the outer metal coating and the inner tube, an electric discharge takes place through the glass and the intervening air space. Air enters the casing through holes in the bottom and passes up through the space between the outer and inner tubes. In its passage through the electric discharge a portion of the oxygen contained therein is changed to ozone, and in this form is drawn through an orifice in the top of the casing and mixed with the air circulated by the fan. The fan provided with each ozonator is 8 in. in diameter, and may be operated independently of the ozone-producing units. A control is also furnished allowing the fan to run without ozone, with one-half ozone capacity, with full ozone capacity, and stopping all operation. Size 8 by 10½ (punched for binding). Pp. 8.



ALTERNATING CURRENT HOUSEHOLD OZONATOR.



HOUSEHOLD OZONATOR WITH CASING REMOVED.

M-H STEEL VALVES AND FITTINGS for high-pressure and superheated steam, made by McNab & Harlin Mfg. Co., Paterson, N. J., are the subject of the company's latest monthly bulletin of product. These valves are made with monel metal and nickel alloy trimmings. Size 5 by 7 in. Pp. 8.

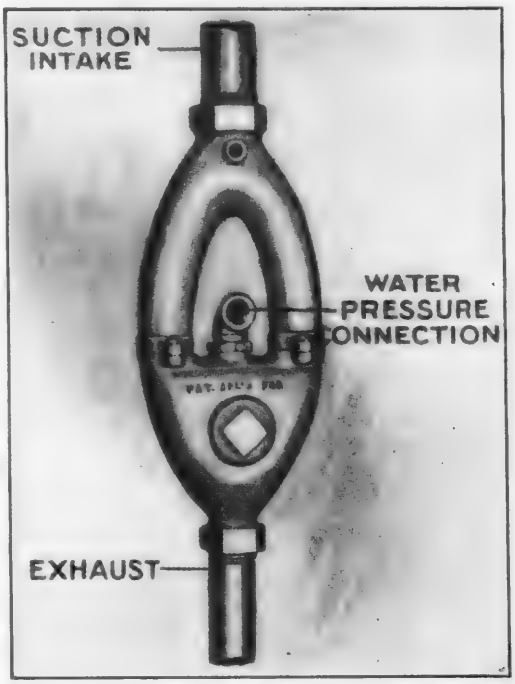
Modern Vacuum Cleaning Apparatus

17—The Cyclone Vacuum Cleaner.

Another type of stationary vacuum cleaning apparatus which depends on the action of water to create the desired suction is shown in the accompanying illustrations, and is known as the Cyclone vacuum cleaner. The central feature of this system is the suction generative device which is made of brass and is wear-proof and rust-proof. The pipe, connected with the water system A, allows the water to enter through the intake nozzle B. The force of the water, as it spurts down the pipe C, creates a vacuum, which exhausts the air from the seamless brass tubing pipe above D, to which the vacuum hose and wand are connected.

An unobtrusive handle F in the floor, conveniently located, permits the water to be turned on or off at will. The amount of water used is said to be less than that required for the sprinkling of the ordinary lawn, while the cost of the apparatus itself corresponds with that of a standard portable cleaner.

TYPICAL INSTALLATION OF CYCLONE VACUUM CLEANING SYSTEM.



SUCTION GENERATIVE DEVICE OF CYCLONE VACUUM CLEANING SYSTEM.

The dust and dirt are carried down into the pipe below the suction generative device where they mix with the stream of water. The foul air is carried off in bubbles and it escapes through an exhaust pipe G, while the dust and dirt are taken by the water through a trap H in the bottom of the basement and discharged into the sewer I.

Provision is made so that the air, which is washed and purified by the water, may be directed into any stuffy basement room that needs ventilating or into a furnace to provide fresh air, or arrangements may be made for the return of this purified air into the room from which the foul air was taken.

This system, it is pointed out, always works at maximum efficiency, because there is no place where the air and water can be obstructed, such as sometimes occurs with dirt bags. The system is applicable to the cleaning of floors, walls, mattresses, draperies, curtains, carpets, rugs, upholstering, or similar kinds of surfaces.

The system is placed in operation by turning on the water by means of handles in the floors of the various rooms. Attention is also called to the noiseless operation of the system, due to the absence of moving parts. An observation glass, located where the hose is connected with the intake pipe shows the amount of dust being removed. When no dust shows, it is an indication that the given spot is cleaned.

The system is manufactured by the Cyclone Vacuum Cleaner Co., 716-717 Hippodrome Building, Cleveland, O.

The Early History of Vacuum Cleaning.

Additional light on the early history of vacuum cleaning is contained in a letter recently received by Maxwell S. Cooley, author of "Vacuum Cleaning Systems," from the British Vacuum Cleaner Co., Ltd., of London, England. In its letter this company calls attention to the fact that the Booth patents, under which it is operating, is the same patent now in effect in the United States under the name of Kenney, and that the Booth patent was the first to be issued covering the fundamental features of a vacuum cleaning system.

"The inventor Booth," says a writer, "is a well-known civil engineer in England, being a full member of the Institution of Civil Engineers, and practicing in Westminister, in London, as such in a large way. In the early part of 1900 he commenced considering the use of atmospheric air for the purpose of cleaning, and after certain experiments, on August 30, 1901, he applied for patents throughout the world for his invention. A search through the United States Patent Office will reveal that Booth's application, on or about the date mentioned in 1901, was filed in the patent office and subsequently this patent application was sold to Mr. David T. Kenney, a United States citizen.

"Mr. Kenney had been considering, so he informed us, the proposition of cleaning by vacuum, but up to then he had, like most other American thinkers on the cleaning system, been imbued wholly with the idea of using compressed air. However, after the purchase of the United States application for a patent, he took out a patent, under his priority rights as a United States citizen, which is now known as the Kenney patent, embodying the whole of the Booth patent application, which, the moment the Kenney application was on file, was allowed to lapse. The foregoing are the facts as to how modern cleaning by vacuum had its beginning in America.

"In the very early part of 1902, the inventor's brother, Stone Booth, who was occupying himself in Boston in literary pursuits, came to England and was shown the Booth vacuum system in operation. So impressed was he with the system that he took two machines of the larger type; that is to say, of the 4 H. P. type portable, back with him to the United States, and a number of demonstrations were commenced between Stone Booth and Mr. Kenney, which ultimately resulted in the requirements by Mr. Kenney, as set forth above, of the United States patent application.

"The Booth system is known throughout the world. The patents for foreign countries have been sold for a sum approximating £68,000, a very small sum when he value of the invention, which is now known, is taken into account.

"The vacuum cleaning system has been developed in such a way that we are now dealing with the removal of coal dust from mines, the removal of all classes of dust from factories, such as boot factories, ore refineries, leather works, color works, printing works, etc., for the textile industry for removing dust from carding engines, for large power plants for emoving dust, that is, flue dust fom the boiler flues and also dust from the economizers that go with such plants, and in fact, everywhere where dust is found.

"The success of this patent in England has meant very little litigation, but you will see by the notice which we enclose that the patent has been held valid by the House of Lords, which places it in a master position. The result is that many machines made in America, such as the Santo and Duntley, and others, are being sold in this country (England) under the licenses of the Booth patent.

"Referring to the first portable cleaner constructed, we were sending portable machines to the United States in a portable form in 1902."

The letter is signed by Charles F. Hitchins, M. I. Mech E., managing director of the British Vacuum Cleaner Co., Ltd., London.

In commenting on the foregoing statements, Mr. Cooley says, "Mr. Kenney made patterns and models for vacuum cleaning machinery and appliances in 1900, or near if not coincident with the work of Mr. Booth in England. Mr. Kenney applied for his patent Nov. 29, 1901. Mr. Booth applied for his British patent Aug. 30, 1901, but did not file a complete claim until May 28, 1902. Mr. Booth's application for his American patent was not filed until Jan. 27, 1902, or two months later than Mr. Kenney. This American application of Booth's was not purchased by Mr. Kenney

until 1904 and was not allowed to lapse until the Kenney patent was granted in 1908.

"Mr. Kenney first heard of the work of Mr. Booth in vacuum cleaning through conversation with men who had seen it in London in the fall of 1902, and also through a consular report of about that time. Mr. Kenney saw the Booth apparatus in action in Boston during the latter part of 1903 and purchased the Booth apparatus of the Boston company early in 1904. Mr. Kenney's own apparatus was installed in the Frick Building early in 1902.

"From the above data, all of which were taken from sworn statements of Mr. Kenney and records contained in the patent papers in connection with various suits in connection with the Kenney patent, it is evident that while Mr. Booth may be the first person in the world to utilize a vacuum for cleaning, Mr. Kenney first introduced vacuum cleaning in America on a commercial basis.

"Regarding the statement that the British Vacuum Cleaner Company had portable machines in this country before the machine of Dr. Noe, the writer does not consider a 4 H. P. machine, mounted on a truck, as a portable in the sense we now use the word."

Scott Company Succeeds the John G. Sutton Company.

The John G. Sutton Company, well known San Francisco heating contractors, has been reorganized and will, in the future, be known as the Scott Company. William P. Scott is president; H. M. Van Pelt, vice-president, and C. J. Dowdy, secretary. Mr. Sutton retires entirely from the company, as it is his intention to devote himself to the management of the Ocean Shore Railroad. Messrs. Scott and Sutton had been associated together since before the San Francisco fire. At that time the business was carried on under the name of John G. Sutton & Co. In 1906 the company incorporated as the John G. Sutton Company, Mr. Sutton being the president, Mr. Scott vice-president, and Julia A. Scott, secretary. Since the fire the company has executed some of the largest heating and plumbing contracts in the west.

Samuel R. Lewis, a junior member of the discontinued firm of Lewis & Kitchen, Chicago is engaged in the practice of consulting heating and ventilating engineering, specializing in schools and public buildings, with offices at 910 Michigan Ave., Chicago. Mr. Lewis is designing engineer of the schools in Toledo and Columbus, O., as well as consulting engineer to James B. Dibelka, the Illinois state architect.

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

Third Monday in Each Month—Meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, Engineering Societies' Building, 29 West 39th St., New York (evening). Subject for April meeting: "Hot Water Heating."

Second Monday in Each Month—Meeting of the Illinois Chapter, American Society of Heating and Ventilating Engineers, in Chicago (evening). Subject for the April meeting: "Air Washers."

Second Tuesday in Each Month—Meeting of the Massachusetts Chapter, American Society of Heating and Ventilating Engineers, in Boston (evening).

May 25-28, 1914.—Sixth annual convention of the National District Heating Association, Rochester, N. Y.

June 10-13, 1914.—Twenty-sixth annual convention of the National Association of Master Steam and Hot Water Fitters, Atlantic City, N. J. Headquarters at the St. Charles Hotel.

June 16-18, 1914.—Thirty-second annual convention of the National Association of Master Plumbers, Atlantic City, N. J. Headquarters at the Hotel Rudolf.

June 16-19, 1914.—Spring meeting of the American Society of Mechanical Engineers, Minneapolis and St. Paul, Minn.

Miscellaneous Notes.

Saginaw Heating Co., Saginaw, Mich., is being formed by Herbert F. Wills, who

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owns the franchise for the central station heating plant in that city.

Columbia University, New York, announces a new advanced course in engineering from and after July 1, 1914. The requirements of admission to the Schools of Mines, Engineering and Chemistry will be raised, making them advanced or graduate schools to which students of any branch of engineering may come for the highest type of training. The new arrangement will mean a course of specialized professional study of three years after three years of preliminary college training.

Better Industrial Relations Exhibit will be held April 18-25 at 2 West 64th Street, New York. It is designed to show the devices in modern business which tend to make more harmonious the relations between employer and employee and to better the conditions of employment. The Business Men's Group of the Society for Ethical Culture will have charge of the exhibit. Arrangements have been made for special evening lectures by industrial leaders of the country.

San Francisco, Cal.—Rapid progress is reported in the working out of the final programme of papers for the International Engineering Congress to be held in San Francisco in 1915. The programme for the various sections of the congress is practically completed, and notices of it will be published in the near future. The papers are being distributed by subscription, and the Committee of Management asks for the help of those interested in sending in their subscriptions at an early date for the guidance of the committee.

Thomas Tait, until recently with the Moline Vapor Vacuum Heating Co., Moline, Ill., has been appointed superintendent of the heating department of M. J. Gibbons, Dayton, O.

Plumbing, Steam and Metal Salesmen's Association of Maine held its eighth annual meeting at Portland, Me., March 9. Byron E. Near, of the H. W. Johns-Manville Co., the retiring president, officiated at the business meeting as well as at the banquet which followed at Riverton Park Casino. The new president is Archie E. Campbell.

Eastern Supply Association held a meeting at the Hotel Astor, New York, February 18, President L. O. Koven presiding. Two hundred members were present. During the meeting a moving picture exhibit of the manufacture of modern wrought iron pipe manufactured by the National Tube Company was made by a representative of the company. John A. Murray, the association's representative at the meetings of the Chamber of Commerce in Washington, reported the urgent need of business men taking an active interest in the bills now pending in Congress.

Central Supply Association met at the

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THE BISHOP-BABCOCK-BECKER CO., Cleveland, Ohio

Sherman House, Chicago, February 25, with President C. V. Kellogg in the chair. The association listened to an address by Marshall Cushing, editor of the "How" Magazine, who spoke on the subject of legislation. Mr. Cushing recounted the unsuccessful efforts of the National Association of Manufacturers to defeat the 8-hour bill. He also discussed the anti-injunction bill now before Congress. Announcement was made that a joint meeting of the Eastern and Central Supply Associations will be held in Detroit in June. Among the firms elected to membership is the Lavigne Mfg. Co., Detroit.

Tacoma, Wash.—Application for a central heating franchise has been filed by the Tacome Central Heating Company, which plans to operate in the North End residence district. Vaughn Morrill, secretary and treasurer, says that the present capitalization of the company will be $300,000. The company's plant will be situated near the waterfront at the foot of North Sixth Street and will be designed to burn mill refuse. The equipment will be installed by the American District Steam Co., North Tonawanda, N. Y.

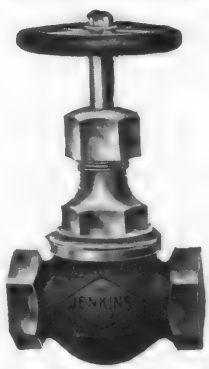
Chicago, Ill.—During the hearing of the twelve suits of the city against the Chicago Railways Company for failure to properly heat its surface cars as required by ordinance, it was brought out in the testimony that if the cars were heated in the car barns the barns would be "extra hazardous" as an insurance risk.

Burlington, Ia.—There is a possibility that the central station heating plant in Burlington may be abandoned as a result of the operation of the new power plant at Keokuk. This would require many individual boiler installations for heating purposes in that city.

Alton, Ill.—Alton patrons of the central heating system of the Alton Gas and Electric Company are expecting that they will be obliged to provide private heating systems for their homes. The present central heating system is connected to the old power house, which the electric company plans to abandon at the end of the winter. Among the buildings at present supplied with heat from the central station are the City Hall, one school house, many business houses, the Masonic Temple building, several hotels and office buildings, and a large number of residences.

Canton, O.—Patrons of the local utilities company, which supplies steam heat from a central station, have filed a petition with the State Utilities Commission for an investigation of the quality of the heat furnished and an adjustment of the rates.

Boston, Mass.—A campaign to secure better ventilation in street cars has been started in Boston by a number of civic organizations. The first meeting was held at the headquarters of the Woman's Municipal League, 6 Marlboro Street. Among those present were Prof. E. B. Phelps, of Washington, D. C., who presented a report



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on the condition of the air in street cars; Prof. George C. Whipple, Prof. M. C. Whipple and Dr. William R. Lord.

Manufacturers' Notes.

United States Radiator Corporation, Detroit, Mich., elected the following officers at its recent annual meeting: President, C. C. Jenks, succeeding R. J. Gross, who is retiring from active business; vice-president and treasurer, Henry T. Cole; secretary, E. C. Reed; assistant treasurer, W. E. Masher.

Foxboro Co., recently organized under the laws of Massachusetts, has taken over all the assets and liabilities of the Industrial Instrument Co., of Connecticut, which was a holding company, and of the Standard Gauge Mfg. Co., of Connecticut, with factory at Foxboro, Mass. The Foxboro Company manufactures the well-known line of Foxboro improved recording gauges, thermometers, tachometers and pyrometers which are sold by the Industrial Instrument Co., having its main offices at Foxboro and branch offices in New York, Chicago, St. Louis, San Francisco and Birmingham, Ala. The Foxboro Company owns all of the capital stock of the Industrial Instrument Co. Edgar H. Bristol and Bennet B. Bristol continue as president and treasurer, respectively, of the Foxboro Co. In fact, there are no changes in the personnel or policies of the companies, the above-mentioned changes being made to concentrate and simplify the organization.

Moline Vacuum-Vapor Heating Co., Moline, Ill., has voted to increase its capital stock from $35,000 to $50,000. This company manufactures the well-known Moline system of vacuum-vapor steam heating.

Toledo Pipe Threading Machine Co., Toledo, O., will build a new factory building at Summit and Magnolia Streets, on land recently purchased at that point. The factory will occupy a ground space of 100x160 ft. Part of the building will be two stories high and the remainder one story high with saw-tooth roof construction. Architect, George Mills.

Hydro Pneumatic Cleaner Co., Cleveland, O., has opened a new agency in Toledo at 1752 Broadway in charge of Henry Keller.

Novelty Iron Works, Canton, O., elected the following officers at its annual meeting: President, F. M. Mechling, Canton; vice-president, A. S. W. Huffman; treasurer, John H. Waters, Johnstown, Pa.; secretary, H. K. Downe, Canton; assistant treasurer,

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With J-M Sectional Conduit, steam, gas, water, brine, ammonia and other liquids can be conveyed underground with practically no waste or leakage. It saves over 90 per cent. of the heat that would otherwise escape through uncovered or poorly insulated pipes.

J-M Sectional Conduit is a vitrified conduit made in 3-foot sections, salt-glazed inside and out. Chemical action of the earth, gases, acids, etc., have no effect on it. The weight or movement of pipes cannot injure it. Is permanently durable and practically indestructible.

J-M Conduit is divided in duplicate numbered upper and lower sections, so pipes can be laid and inspected under pressure before the upper half is cemented on. There is no chance of conduit leakage because of mismated sections. It can easily be opened up at any time to locate leaks in pipes. And it can be taken up and relaid without injury.

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Boston	Cleveland	Kansas City	Minneapolis	Philadelphia	St. Louis
Buffalo	Dallas	Los Angeles	New Orleans	Pittsburgh	Syracuse 1432

August Bosche, Canton; general sales manager, C. M. Converse, Canton.

Magee Valve Co., New York, recently incorporated with a capital stock of $25,000, has taken quarters at 105-107 Beekman Street, for the manufacture and sale of its line of Jumbo steam specialties. President and treasurer, F. H. Tweed; general manager, Alonzo H. Magee.

American Radiator Co., Chicago, Ill., showed, in its financial report for the year ending January 31, 1914, a balance of $1,871,267, equal to 25.97% on the $7,441,500 of common stock. This compares with 21.97% earned on $6,765,000 of common stock the previous year. Earnings of the company's foreign plants were $884,248, somewhat less than the previous year. These earnings, combined with those of the home company, are the equivalent of 39.86% on the common stock. The company's net profits of the year on its home operations are $2,081,267, as compared with $1,696,193 the previous year. The surpluses of the parent and foreign companies, added to the outstanding stock of the company, aggregate $23,046,476, the surplus of the parent company being $6,704,190 and the aggregate surpluses of the foreign companies being $5,900,787. The latter figure represents the total earnings of the foreign plants from the time of their establishment, no dividends ever having been declared. The retiring directors were re-elected.

Lord & Burnham Co., Irvington, N. Y., manufacturers of the Burnham line of steam and hot water boilers, announces the addition to its selling force of C. C. Johnson, formerly manager of the United States Radiator Corporation's Pittsburg branch. Mr. Johnson was previously connected with the Herendeen Mfg. Co.

Crane Co., Chicago, Ill., will build new quarters for its Des Moines, Ia., branch, at a cost of $150,000. The building, which will be of brick, steel and concrete, 68x118 ft., will have five stories and basement.

Holland Furnace Co., Holland, Mich., has increased its capital stock from $100,000 to $250,000.

Kellogg-Mackay Co., Chicago, Ill., jobbers of heating and plumbing supplies, whose affairs were recently placed in the hands of a receiver, will be operated by a trustee, Fred A. Busse, former mayor of Chicago, having been appointed to that office by Frank L. Wean, referee in bankruptcy.

H. W. Johns-Manville Co., New York, announces that its Indianapolis branch has been compelled to seek larger quarters at 408-410 North Capitol Ave. The company's

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DETROIT, MICHIGAN, U.S.A.

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Louisville branch has also taken larger offices at 659-661 South Fourth St. Both of these branches include ample warehouse accommodations, in addition to showrooms for the display of this firm's varied line of pipe coverings, insulating materials, etc.

Tyler Underground Heating System, Pittsburg, Pa., announces the appointment of T. E. Keegan as the company's assistant manager. Mr. Keegan is known to the heating trade, having been for nine years with the Consolidated Engineering Co., of Chicago. He will handle the company's line of underground heating materials, also low pressure traps, intermediate traps, water weighing machines for boiler house work, and condensation meters and hot water meters for central heating plant work, calling on the trade in all the large cities in the United States and Canada.

Iroquois Engineering Co., Chicago, Ill., manufacturers of the Acme air washer, announces that owing to the increase in the sales and installations of the Acme air washers the company has found it necessary to more closely confine its endeavors to air conditioning, and for that reason has discontinued its other alliances. The company will not be interested any longer in the sale of the Sparks pump but will confine itself to the manufacture and sale of the Acme air washer and to the handling of the Fitzgibbon boilers.

New Firms and Business Changes.

R. C. Atkinson Co., Niles, Mich., has added a department of heating and plumbing to its business.

New Incorporations.

Pacific Heater Mfg. Co., Los Angeles, Cal., capital $25,000. Incorporators: G. A. Listen, L. Giles, H. C. Walker and others.

Panama Heating & Construction Co., Long Beach, Cal., capital $10,000. Incorporators: Frank W. Baker, Albert H. Edmund and Floyd A. Barnesare. The president of the company is Frank W. Baker.

National Heater Co., Cleveland, O., capital $100,000, to manufacture house heating boilers. Incorporators: A. L. Stowell, C. H. Royon, R. L. McCarthy, F. M. Wolke and M. T. Gorton.

Southern Heating Co., Memphis, Tenn., capital $10,000. Incorporators: N. W. Lunda, P. F. Lunda, J. W. Beatty, F. Underwood and F. H. Barker.

Hygeia Air Cooler Co., Los Angeles, Cal., capital $50,000. Directors: G. M. Babcock, E. C. Leffingwell and F. E. Wilson.

Century Ventilating Co., 80 Maiden Lane, New York, capital $50,000. Incorporators: William Thomas, J. F. Cunningham and B. F. Foster.

Century Heating Service, Indianapolis, Ind., capital $6,000, to deal in heating supplies. Directors: J. W. Cooper, E. McMahon and O. Voorhees.

Michigan Lubricator Co., Detroit, Mich., capital $200,000. Incorporators: John B. Corliss, John Coyne and Edward C. Nagel.

John A. Anderson Co., Omaha, Neb., capital $10,000, to conduct a heating and plumbing business. Incorporators: John A. Anderson and C. M. Rylander.

Van Zile Ventilating Corporation, New York, capital $100,000, to deal in ventilating apparatus. Incorporators: H. L. Van Zile and T. A. Lewis, of New York, and J. G. Wright, of White Plains, N. Y.

Magee Valve Co., New York, capital $25,000, to manufacture heating specialties. Incorporators: George H. Schubert, Dwight W. Dematte and B. M. Schwarzlow.

Central Plumbing & Heating Co., Chicago, Ill., capital $25,000, to deal in heating and plumbing specialties. Incorporators: R. G. Smith, Thomas A. Murphy and Felix F. Gogolinski.

East Moline Plumbing & Heating Co., East Moline, Ill., capital $5,000, to conduct a heating and plumbing business. The principals are George W. Speck and C. R. Nussle.

Sanitary Plumbing & Heating Co., Virginia, Minn., capital $10,000, to conduct a heating and plumbing business. President, Andrew G. Grande; vice-president, Edward L. Blackwell; secretary, Emery S. Stevenson; treasurer, Andrew C. Skumantz.

John A. Mills Co., Canton, O., capital $20,000, to do a general contracting business for heating, plumbing and gas fitting. Incorporators: August Boernier, August Nunamaker, Fred P. Crumrine, Homer E. Le Beau and Charles M. Ball.

Electric Steam Radiator Co., Portland, Me., capital $200,000. Promotors: John D. Ross, Clinton T. Swett, Edward S. Anthoine, all of Portland.

Combustion Engineering Corporation, New York, capital $100,000, to manufacture and deal in furnaces, boilers, heating plants, etc. Incorporators: G. E. Learnard, R. C. Peabody and J. J. Roche, all of New York.

Simplex Vapor-Vacuum Co., Chicago, Ill., capital $2,500, to manufacture heating specialties. Incorporators: F. J. Murray and A. L. Ringo.

Contracts Awarded.

M. J. Gibbons, Dayton, O., heating and ventilating Stivers Manual Training High School at Dayton, for $33,584.

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The above illustrated volume, consisting of 323 pages, is an exhaustive treatise on the subject of "Heating and Ventilation," based upon the information gained during a half century's experience designing and installing heating and ventilating systems. Every subject is treated in the light of the latest developments and information and is thoroughly abreast of the times.

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Monarch Ventilator Co., New York, heating and ventilating School No. 7 at Jamestown, N. Y., for $10,873. Other bids were submitted by the American Warming & Ventilating Co., Elmira, N. Y., $9,000; and by the Bryce Heating & Ventilating Co., Toledo, O.

Louis F. Andrea & Co., Baltimore, Md., heating and ventilating annexes to the High School in Johnstown, Pa., for $21,580.

James J. Horan & Co., Troy, N. Y., heating new armory for Troop B, of Albany, for $5,847.

Hostick Heating Co., Memphis, Tenn., heating addition to the West Tennessee Asylum, of Bolivar, for $6,200.

Pulte Plumbing & Heating Co., Grand Rapids, Mich., vacuum cleaning system for the new South High School at Grand Rapids, to cost $1,200; also plumbing contract, at its bid of $23,574. The contract for the ventilating apparatus went to the Lietelt Iron Works, at its bid of $27,217. The temperature regulation apparatus will be installed by the Johnson Service Company, Milwaukee, for $5,445.

O. A. Hanklinson, Ypsilanti, Mich., heating and ventilating new auditorium and conservatory for the Ypsilanti State Normal School. The plumbing contract went to James H. Crumley, of Detroit, at his bid of $3,414. The building will cost $150,000.

American Heating & Construction Co., Los Angeles, Cal., heating and ventilating new building for the Merchants' Fireproof Building Co., for $12,000.

Fisher & Blair, Columbus, O., hot water heating and plumbing three flat buildings for Cluek Bros. The work will amount to $9,000.

Bennett & Mason Co., Rochester, N. Y., heating and ventilating new Hutchinson High School in Buffalo for $25,000.

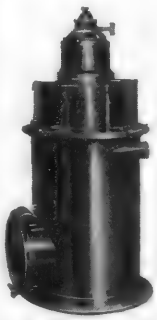
John J. Nesbitt, Philadelphia, Pa., heating new Price School at 47th and Locust Streets, for $14,599; the ventilating contract went to Purks & Mellon, at their bid of $2,557. The latter firm also secured the plumbing contract for $7,900.

Weatherly Heating Co., Grand Rapids, Mich., heating and ventilating the new Franklin Street School at Grand Rapids. The plumbing contract went to the W. L. Cargill Co.

Robert Dalziel, Jr., San Francisco, Cal., heating and ventilating new San Francisco City Hall for $55,663.

Eureka, Cal.—Bids were received as follows for the heating and ventilating of the new high school at Eureka: J. C. Hurley Co., San Francisco, $11,150; Pacific Blower & Heating Co., $12,385; Ohman Hardware Co., $14,000; Kierman & O'Brien, $12,300; J. E. O'Mara, $12,727; Robert Dalziel, Jr., $12,613; The Turner Co., $13,610; Scott & Co., $11,780; Victor Engineering Co., $12,-395. No contracts were let as the total of the bids received for the erection of the building was $10,000 above the estimated cost.

Purdy Bros., Caro, Mich., heating and



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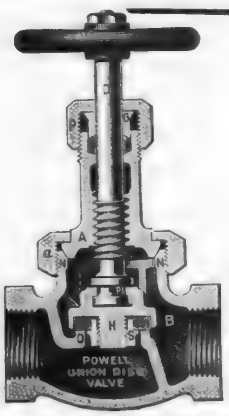

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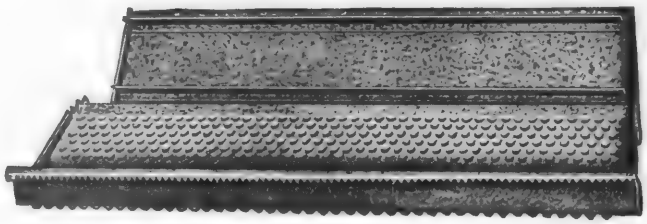

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THESE eliminators remove the entrained moisture from the washed air. Every particle of the washed air passing through the STURTEVANT Air Washer must pass over, around and through the various parts of the eliminator. This has the effect of scrubbing the air, of removing every particle of soluble dust and dirt. The water removed from the air drips from the serrated edges of the eliminator forming an additional wall of spray through which the air must pass, providing an additional washing area.

These eliminators are positive in action. They remove every drop of entrained moisture discharging the air clean and dry.

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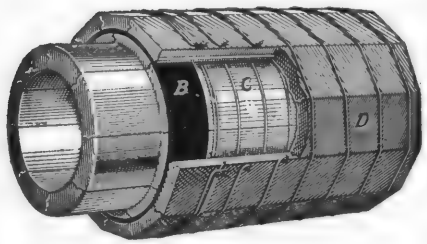

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ELMIRA . . N. Y.

plumbing hotel building on the epileptic farm at Wahjamega, for $3,000.

Hartford, Conn.—Bids were received as follows for the central heating plant for the high school buildings: Taylor-Flagg Co., Meriden, Conn., $27,388; Libby & Blinn, Hartford, Conn., $29,150; Holyoke Valve & Hydrant Co., Holyoke, Mass., $36,756; Cleghorn Co., Boston, $31,775; Ingalls & Kendricken, Boston, $31,840; Albert B. Franklin, Boston, $32,000. No contracts were let as the lowest bid was about $7,000 in excess of the estimate.

Belden, Parter & Gray, Minneapolis, Minn., heating and plumbing Minneapolis Athletic Club building for $60,000. The building will be 12 stories high.

Ernst Hardware & Plumbing Co., Seattle, Wash., heating and plumbing Netherlands-American Mortgage Bank, in Seattle.

Eckart Plumbing & Heating Co., Seattle, Wash., heating and ventilating and plumbing new $80,000 school building at South Bend, Wash.

Arnold-Evans Co., Spokane, Wash., heating new group of buildings at the State Institution for the Feeble Minded at Medical Lake for $15,270; the plumbing contract went to Edwin M. McGraffrey Co., at its bid of $14,288.

James Hunter Heating Co., Albany, N. Y., heating Albany Industrial Building at Albany for $11,504; the plumbing contract went to Joseph P. Maguire of Albany at his bid of $9,640.

Alton Plumbing & Heating Co., Alton, Ill., heating and plumbing new Alton Mineral Springs Hotel. The heating contract amounts to $5,460, and the plumbing contract to $7,892.

Business Chances.

Washington, D. C.—Sealed proposals proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until April 15, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Tarboro, N. C. Two stories and basement, 4,160 sq. ft. ground area.

Until April 16, 1914, for the construction, including mechanical equipment, etc., of the U. S. Post Office at Mobile, Ala. Two stories and basement, 18,000 sq. ft. ground area.

Until April 21, 1914, for the construction complete, including mechanical equipment, of the U. S. Post Office at Camden, S. C. One story and basement, 3,400 sq. ft. ground area.

Until April 27, 1914, for the construction complete, including mechanical equipment, of the U. S. Post Office at Cadillac, Mich. One story and basement, 6,140 sq. ft. ground area.

Until April 30, 1914, for the construction complete, including mechanical equipment, of the U. S. Post Office at Bryan, Tex. One story and basement, 3,700 sq. ft. ground area.

Until May 2, 1914, for the construction complete, including mechanical equipment, etc., of an animal house for the Hygienic Laboratory, Washington, D. C. Two stories and basement, 4,200 sq. ft. ground area.

Until May 4, 1914, for the construction complete, including mechanical equipment of the U. S. Post Office at Shelbyville, Tenn. One story and basement, 3,600 sq. ft. ground area.

Until May 5, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Wahpeton, N. D. One story and basement, 3,280 sq. ft. ground area.

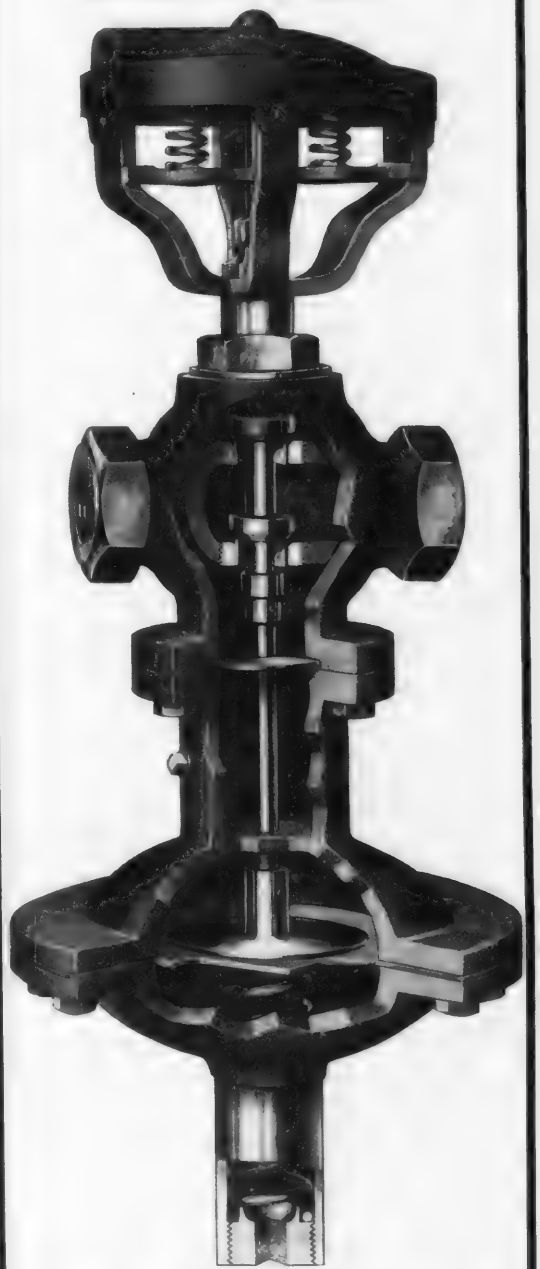
Until May 6, 1914, for the construction complete, including mechanical equipment, etc., of the U. S. Post Office at Grass Valley, Cal. One story and basement, 4,450 sq. ft. ground area.

Newton, Mass.—On the recommendation of the school board, the Board of Aldermen has appropriated $9,000 for improving the heating and ventilating system at the Technical High School building.

Success of Motion Pictures Illustrating Pipe Manufacture.

The success of the motion picture films illustrating the manufacture of "National" pipe from the iron ore to the finished product, which were taken under the direction of the National Tube Company, Pittsburg, Pa., has led to their exhibition before a number of business associations and educational institutions, including the American Society of Heating and Ventilating Engineers, the National Association of Stationary Engineers, and the University of Kansas. These pictures, which are in three films, represent eight months' work and the expenditure of thousands of dollars. They take up all of the important steps in the manufacture of "National" pipe, starting at the Mesaba ore ranges in Minnesota and showing the various steps until the pipe is shipped out as a finished product. The company advises us that information as to time and place of further exhibitons of the films may be obtained by addressing Mr. Edward Worcester, Jr., manager of Sales, Frick Building, Pittsburg.

The light-man regulates his juice,
And makes the world look sunny;
The Heat-man he just turns her loose,
And wastes a lot of money.



Pressure and Temperature Regulators for either Steam or Hot Water

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Situation for Heating and Ventilating Engineer and Draftsman.

The United States Civil Service Commission announces an examination for heating and ventilating engineer and draftsman, on April 22 and 23, 1914, to fill vacancies in this position at $1,200 per annum, in the Office of the Supervising Architect, Treasury Department Washington, D. C., and in positions requiring similar qualifications. Subjects: Practical questions in heating and ventilating; drawing and design; training and experience. Applicants must have had not less than four years' practical experience in designing or installing heating and ventilating systems, of which a technical degree will be considered equivalent to not over 2½ years. Applicants must be examined in the state or territory in which they reside and have been resident therein at least one year. Apply to the United States Civil Service Commission, Washington, D. C.

Convenient Form of Pocket Pencil.

A handy vest pocket pencil, of the new propel and repel type, has lately been placed on the market by the Joseph Dixon Crucible Co., Jersey City, N. J. It is furnished in two sizes, ⅜ in. in diameter and 4½ in. long, and ¼ in. in diameter and 3¾ in long. A box of extra leads accompanies each pensil.

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See what an absolutely different proposition it is than all these other systems. It's every bit as quick as hot air, isn't permanently hitched to a boiler factory noise like any old steam system is.
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(Signed) THE MAN WHO KNOWS.
We have a new Moline Catalog and proposition for every Contractor who talks quality. Send for yours.
Moline Vacuum Vapor Heating Co.
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No more pressure than in your tea-kettle and just as simple

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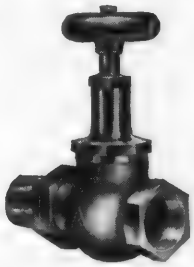

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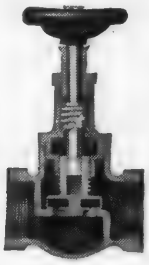
with Male Union



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The Syracuse Packless Standard Globe Valve is of bronze and is especially adapted for high pressure steam systems.

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Returns of building operations for February, 1914, in 60 cities, officially received by the American Contractor, Chicago, reach a total of $41,173,253, as compared with a total of $41,128,190 in the same cities for February, 1913. Trade a year ago was regarded as active, and the showing must, therefore, be regarded as favorable. New York showed large losses in all the boroughs with the exception of Brooklyn, where the increase was 49 per cent. The figures for Manhattan are $2,761,042 as compared with $9,160,535 a year ago. Chicago showed a slight gain, as did Philadelphia, Cleveland, Buffalo and Newark, N. J. Detroit showed a gain of 92 per cent, the operations totalling $3,020,850.

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One of the bosses at ex-Governor Foss's blower works had to lay off an argumentative Irishman named Pat, so he saved discussion by putting the discharge in writing. The next day Pat was missing; but a week later the boss was passing through the shop and he saw him again at his lathe. Going up to the Irishman, he demanded fiercely:

"Didn't you get my letter?"

"Yis, sur, Oi did," said Pat.

"Did you read it?"

"Sure, sur, Oi read it inside and Oi read it outside," said Pat, "and on the inside yez said I was fired, and on the outside yez said, 'Return to B. F. Sturtevant Company in five days.'"

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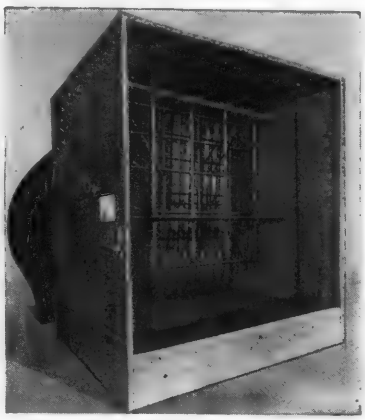

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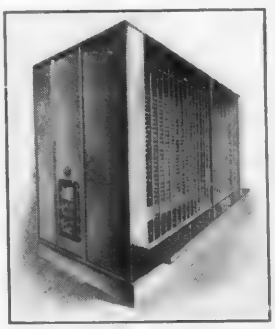

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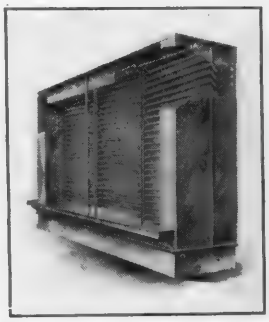

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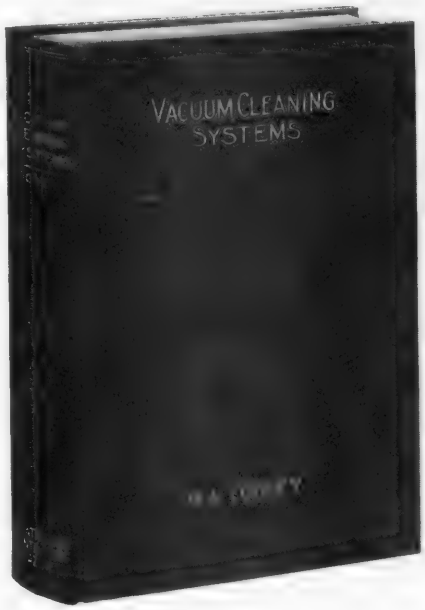

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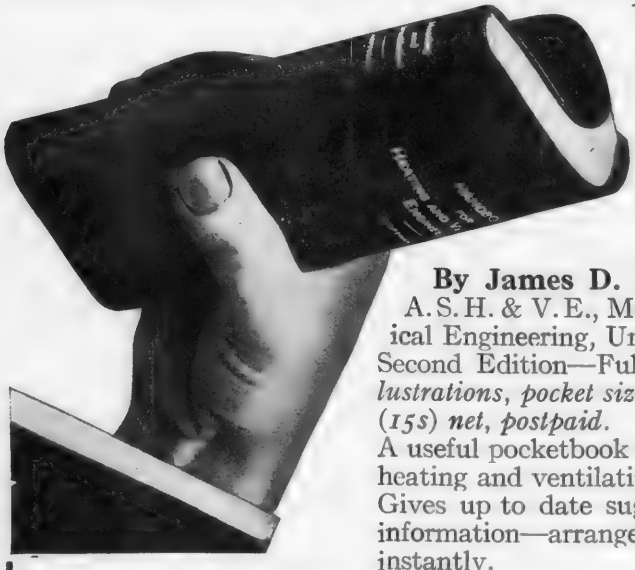

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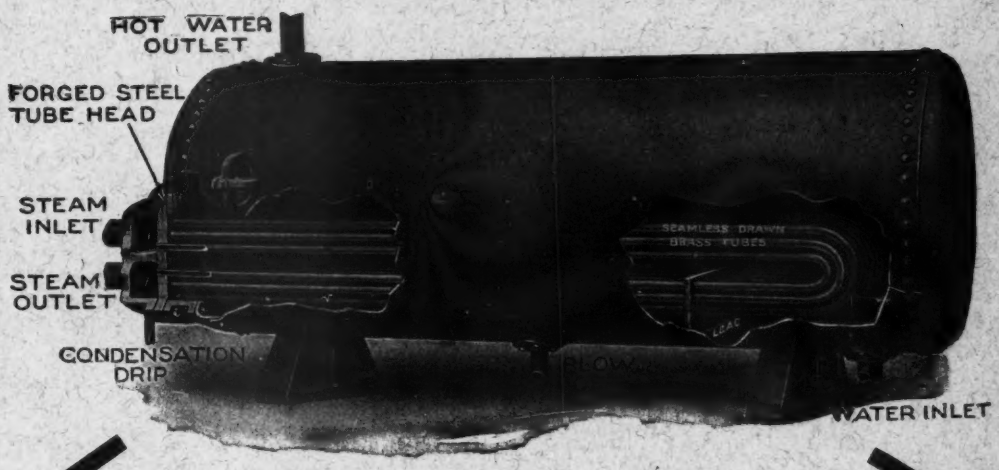

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Both in One Shell

The "U" shaped seamless drawn brass tube heating surface is placed at the lowest point of the tank where the cold water enters, leaving the upper and larger part for the storage of hot water ready for instant use.

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Shells of heavy boiler plate.

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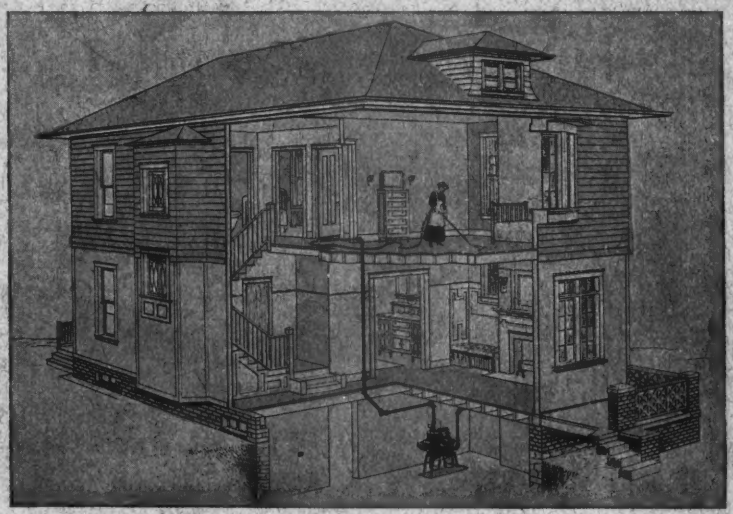
ARCO WAND VACUUM CLEANER is not only easy to install, but very little capital is required to complete a contract. The investment for pipe and fittings is small, and when the machine is installed it can be tested and the collection made almost at once—no delays depending on weather conditions. There is no dull season. A little active sales promotion can provide means at any season to keep your best men busy on extremely profitable work. If installed at the same time with the heating outfit the labor cost is greatly reduced and the profits correspondingly large. Have you received a copy of our new ARCO WAND Vacuum Cleaner Catalog?



Typical installation of ARCO WAND Vacuum Cleaner in residence. Note the simple piping arrangements—easy to estimate and install.

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